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metals review

the news digest magazine

published by the american society for metals

Volume XXVI - No. 4 April, 1953

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Metals Review

THE NEWS DIGEST MAGAZINE

VOLUME XXVI, No. 4 April, 1953

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Explains Incentive Management Plan

At the February Meeting of the Texas Chapter, James F. Lincoln (Center) President of Lincoln Electric Co., Presented an Explanation of His Company's Incentive Management Plan. With Mr. Lincoln are, left, W. Mack Crook, vice-chairman, and Milton W. Phair, chairman (Photo by L. V. Dolan)

Reported by C. L. Horn
Hughes Gun Co.

James F. Lincoln, president of the Lincoln Electric Co., spoke to aproximately 175 members of the Texas Chapter on "Incentive Management in the Metal Industry". At this meeting the Texas Chapter also celebrated Executive Night and a number of the leading executives in the surrounding industries were represented.

Mr. Lincoln stated that incentive to do better work more efficiently is a matter of habit and that money is not the most important consideration. A great deal of effort is put forth to attain respect for ability and ability and recognition are what people want more than money. Mr. Lincoln reviewed his company's incentive system and the advantages gained from it over the past 18 years. An employee's advancement is rated by foremen, time study, inspection and production men. The foreman and salesman are also on the incentive plan and are rated by their superiors by the same method, but by different standards. This incentive plan has not only reduced the cost of production but has created contentment and happiness on the job as well as at home. Every man has ability which is undeveloped. Unless a crisis arises the undeveloped ability is not used. This is called "latent ability". Opportunity to develop is an important consideration.

When a new job is set up, a time-study man and the foreman make a survey of how the job is to be done on a particular machine. They also teach the method to the man who is to do the job and stay with him until his speed of operation is satisfactory.

Labor disputes and problems concerning the incentive system are discussed and a decision handed down by an Advisory Board which is made up of one representative elected from each department, three foremen and Mr. Lincoln. Every promotion or new job, which is created by the company, is filled from within the company.

A suggestion system is used at Lincoln for new ideas. If an employee's suggestion is accepted, he is given a cash bonus of 50% of the first years savings which are a direct result of his suggestion.

The retirement plan used is 2% of the average wage times the number of years of service at the age 60. The employee would receive approximately 40% more if he chose to retire at the age of 65.

The company also has a stock participation plan which allows the employee to purchase stock in the company (which pays approximately 6%). If the employee leaves the employment of the company for any reason or dies, the stock is returned to the company treasure and made available for purchase by their employees. The employee also receives a bonus each year, the amount of which depends on the profits of the company, and is distributed on a percentage basis.

By this system, Lincoln Electric Co. has maintained a high wage scale and had a minimum of labor difficulties.

Austin Illustrates Magnification in Time

Reported by P. H. Parker
Continental Foundry & Machine Co.

National Officers Night at the Calumet Chapter's February meeting was addressed by J. B. Austin, A.S.M. national vice-president. Dr. Austin presented an illustrated talk entitled "Magnification in Time".

Dr. Austin began his talk by citing the great progress that has been made in magnification in space by the use of the electron microscope, and, as an example, showed the resolution of particles which precipitated in a chromium steel to cause so-called 885° embrittlement.

Magnification in time amounts to slowing down and recording motion through photography so that occurrences which happen faster than the eye can register them can be resolved and studied.

Two methods are commonly used, the first consisting of photographing with still cameras, using high intensity flashes of light, and slow motion movie cameras. In slow motion photography, speeds of 100,000 frames per sec. have been used in studying ballistics. However, this involves massive equipment so that the work must be brought to the field of the camera. More commonly, cameras with speeds of 3000 frames per sec. are used. This speed with relation to ordinary photography of 16 frames per sec. gives a magnification in time of nearly 200.

The still camera, with an exposure of 1/10,000 sec., has been used to study such things as quenching techniques and to aid in the training of operators in the employment of correct practices.

Studies of processes, such as the Jominy end quench test, have also been made. In the field of metallography, attempts have been made to record such phenomenon as the formation of martensite needles.

Dr. Austin projected a motion picture film to illustrate various processes studied by the use of the 3000 frame per sec. camera. Through this medium it has been possible to make studies through the tuyeres of a blast furnace which show the blocking effect of scabs and the motion and size of coke particles in the blast. It has also been used successfully in illustrating the turbulence of the metal in an openhearth tapping stream. This study, by showing how air is trapped and carried under the surface, has explained the extensive oxidation and attendant alloy loss which can occur while tapping.

The use of magnification in time has the same limitation as magnification of space—the difficulty of obtaining representative sampling. Since in photographing at 3000 frames per sec., 100 ft. of film is exposed per sec., the possibilities of error in obtaining representative conditions during this short interval are apparent.

Explains High Speed Toolsteel Properties

Reported by Walter Showak
Penn State College

George A. Roberts, chief metallurgist for Vanadium-Alloys Steel Co., spoke on "Properties of High-Alloy Steels" at the December meeting of the Penn State Chapter. His talk was concerned with the fundamental facts of toolsteel heat treatment. He showed how properties of toolsteels change with quenching temperature, tempering temperature, tempering time, and composition.

Dr. Roberts pointed out that the toolsteel industry in this country is composed essentially of 14 companies, most of which produce other steels in addition to these special steels. Toolsteels are characterized by their high carbon content, and how they can be treated to obtain high hardnesses.

Tungsten steels have been in use but, due to the shortage of tungsten, molybdenum-containing toolsteels, with 5-8% molybdenum, are currently more popular.

All high speed toolsteels have a high carbon content which is necessary to obtain high hardness levels when hardened. Despite the wide range of alloy composition of these steels, it was pointed out that they all behave in about the same way. The temperature range used in hardening these steels is 2150-2350° F., which comes within 50° of their melting temperature.

Although hardness is used as the specification for toolsteels, toughness is the property most desired. Toolsteels are more brittle than the normal steels, and, consequently, the impact test specimen employed is the unnotched bar. The impact strength of high speed steels does not change much with hardness, and numerous plots were shown to illustrate the relationship between impact strength and hardness for various austenitizing temperatures. The lower the hardening temperature used on the steel, the greater its toughness.

The bend test is used on toolsteels to determine yield strengths. Toolsteels with low hardness levels tend to have the same yield strength with varying compositions; the same toolsteels at higher hardness levels exhibit different yield strengths with varying composition. The rapid drop-off in strength in steels treated to high hardness levels is believed to be due to retained austenite.

Weighs Pros and Cons of Boron Additions to Steel

Reported by Charles C. Mathews
J. T. Ryerson & Son, Inc.

In a talk before the January meeting of the Philadelphia Chapter, D. H. Ruhnke of the Republic Steel Corp. outlined some of the advantages and limitations of "Boron Alloy Steels." Mr. Ruhnke is chief metallurgist of Republic's Central Alloy District.

Mr. Ruhnke pointed out that usual boron additions amount to only a small fraction of a pound of boron per ton of steel. This addition results in a gain of hardenability, but no other gain or detraction of note. Ferro-boron is usually mixed with such protective elements as silicon, aluminum, zirconium, calcium and titanium before it can be used as a ladle addition to steel. Supply of boron addition agents is limited only by capacity of ferro-alloy producers.

Boron seems to increase hardenability of steel which can be quenched out to 90% martensite, but has very little effect with smaller percentages of martensite. Boron alloy steel anneals with results almost identical to that of the base alloy without boron.

There is a minimum level of alloy with which boron can be used in order to produce hardenability and impact strength equal to an alloy such as SAE 4340. In other words, there is a point beyond which you cannot reduce the alloy content and still obtain effective results in large sections.

Despite early complaints, many of which are unfounded, carburizing grades of boron alloy steel can yield satisfactory results. Mr. Ruhnke cautioned that distortion is a problem which must be considered with these carburizing grades. These grades are usually gas carburized because this method of carburizing makes it easier to control the carbon content of case which must not be allowed to exceed 0.90% carbon. This higher carbon results in a lower hardness.

Speaker Explains Inert-Arc Welding

New Haven Chapter Heard R. W. Tuthill (Right) General Electric Co., Speak on "Automatic and Semi-Automatic Tungsten Inert-Arc Welding" in February. With him are C. B. Christensen, and F. E. J. Storm, technical chairman

Reported by G. F. Whiteley
Heppenstall Co.

"Automatic and Semi-Automatic Tungsten Inert-Arc Welding" was the subject chosen by Roger W. Tuthill, engineer, General Electric Co., when he spoke before the New Haven Chapter in February.

After giving a brief history of the inert-arc welding process, Mr. Tuthill spoke of the main trends in welding today, the shift towards automatic welding, and the great growth of inert-arc welding. These trends are working together and are resulting in greater use of mechanized inert-arc welding.

The speaker explained the different methods necessary to weld aluminum, beryllium copper, and other alloys. Materials like stainless steel, copper and brass alloys are weldable by using a direct-current electrode negative (straight polarity).

Mr. Tuthill discussed proper joint designs and the important factors to consider in the application of automatic inert-arc process for good results. Joint fit-up and control of other welding variables are essential in an automatic system to properly control the welding process.

General Electric Fillerweld equipment and its application on semi-automatic jobs which can be mechanized were also explained and illustrated by the speaker.

Joint ASM-AWS Meeting Hears Changes Which Can Occur During Welding

Reported by James C. Farlow
American Cast Iron Pipe Co.

The January meeting of the Birmingham Chapter was held jointly with the American Welding Society. A program on "Metallurgical Changes Occuring With Welding" was presented by Herbert Kuenzel, head of the mechanical engineering department, University of Alabama.

Dr. Kuenzel stated that in welding it is important to consider the physical changes that take place in the base metal. A small portion of base metal is heated to the melting point rapidly, and metal from the welding rod is fused to the base metal. The base metal and the weld deposit cool very rapidly. This rapid heating and cooling cycle will cause internal stress in the base metal. Different metals accept these changes differently, and to hold changes to a minimum, the correct welding rod must be chosen and good welding procedure followed.

The cooling rate and temperature distribution of the welded area affect the metallurgical changes occuring in the welded area. Fast cooling in some welds forms brittle martensite. This condition reduces the plastic flow of the weld as it solidifies. This fast cooling rate also sets up internal stress. The energy input has little effect on these stresses.

Physical properties are determined by the grain structure after welding. In most welding, a certain amount of preheating or postheating below the critical temperature of the metal will reduce some harmful effects and give a weld that is similar to the base metal if the correct welding rod is used.

Boston Concludes Series On Machinability

Reported by John L. Morosini
D. A. Stuart Oil Co.

The Boston Chapter has recently completed a series of five lectures on "Machinability and Metalworking". Speakers and a brief summary of their lectures are as follows:

On Oct. 31, Nathan Cook, instructor in mechanical engineering, Massachusetts Institute of Technology, spoke on the "Metallurgical Aspects of Metal Cutting". He illustrated his talk with several gadgets which showed the practical theory in the movement of metal by a cutting tool. He discussed the formation of chips and changes in the structure of metals, and the effects of metal cutting on various metalworking tools.

Leo P. Tarasov, research and development department, Norton Co., spoke on the "Metallurgical Aspects of Grinding" on Nov. 14. He discussed the selection of grinding practices of metals according to their metallurgical characteristics.

On Nov. 21, J. Walter Gulliksen, general superintendent of the Worcester Pressed Steel Co., spoke on "Cold Forming of Metals". His talk dealt with the metallurgy and methods of drawing materials into all types of sizes and shapes. He used diagrams to explain many complex points, and demonstrated close to 200 parts which had been drawn at his plant.

Edward Dixon, vice-president in charge of research and metallurgy at the Ladish Co., spoke on "Hot Forming of Metals" on Nov. 28. He explained the metallurgy associated with the production of closed and open die forgings, especially hot forming operations in connection with parts for aircraft, tractors, gas turbines and high-temperature piping.

A. O. Schmidt, research engineer at Kearney and Trecker Corp., gave the concluding lecture on the "Practical and Theoretical Interrelation in Carbide Milling" on Dec. 5. This meeting was held as a regular monthly chapter meeting. Dr. Schmidt illustrated what could be expected of production in the removal of stock of many materials with the proper carbide practice.

Speaker Brings Stainless Up-to-Date

At the December Meeting of the Rhode Island Chapter, G. N. Goller of Armco Steel Corp., Discussed "Modern Trends in Stainless Steels". Shown above are, from left: Arthur S. Johnson, chapter chairman; Gilbert Stafford, coffee speaker; Mr. Goller; and Stanley Knight, technical chairman

Reported by Stanley Knight
Continental Screw Co.

"Modern Trends in Stainless Steels" was the subject of the talk by G. N. Goller, supervising metallurgist, research laboratories, Armco Steel Corp., before the Rhode Island Chapter in December.

Briefing the relatively short history of stainless steel, he climaxed it with the fact that 1951 saw approximately 1,000,000 tons of stainless steel produced in the mills of this country alone. The present military program, highlighted by the expansion and magnitude of the jet engine type of mechanism, has caused development of many complex stainless and heat resisting alloys. Where there were formerly 40 commercially catalogued alloys, 60 are now active.

Nickel, strategically important, and highly restricted by the Government from the hungry commercial field, is so short that several modified straight chromium irons have come into being as able substitutes. Notable is the titanium modification for metal-glass seals, and nickel itself in less than 1% additions to simulate and even better some much higher nickel grades.

Probably the greatest new development is the line of precipitation hardening stainless alloys using titanium, copper or aluminum, both separately or in combinations.

Mr. Goller illustrated his talk with instructive charts and illustrations.

Twenty Years Ago

Quotes From *Metals Review*
January 1933

"A. V. DEFOREST† has developed the Magnaflux test for discovering incipient fatigue cracks and locating seams and discontinuities, and also a new scratch extensometer, a method of control in the field where load conditions cause failure."

—20—

"The new 'Alloy 548' [a tungsten-iron-cobalt composition] features the February issue of *Metal Progress*. Introduced at the January Cleveland Chapter meeting by ZAY JEFFRIES and W. P. SYKES, respectively consulting metallurgist for General Electric Co. and metallurgist for Cleveland Wire Works of that company, the new cutting materials promises to take its place between high speed steel and the cemented carbides."

† Deceased.

Die Steel for Cold Work Topic Of Columbus Meeting

Reported by Andrew N. Eshman

Engineering Laboratory
North American Aviation, Inc.

George A. Roberts, A.S.M. national trustee and chief metallurgist, Vanadium-Alloys Steel Co., was the guest of honor at the annual National Officers' Night held by the Columbus Chapter in December. Dr. Roberts first presented a summary of the business, activities and financial status of the A.S.M. during the past year. Noteworthy was his report on the excellent progress made of the Society's Foundation for Education and Research.

In his technical talk "Die Steel for Cold Work", Dr. Roberts rationalized the cold work die steel picture, covering the influence of tempering temperature, the effect of retained austenite, and the evaluation of mechanical properties in selecting the proper die steel.

Certain high-alloy die steels develop a secondary hardness peak on tempering. As the tempering temperature is raised, the initial hardness decreases, then increases to a maximum at a point where the retained austenite is eliminated. After this peak is obtained, a further increase in tempering temperature gives a corresponding decrease in hardness. The selection of the proper tempering temperature is of vast importance, as the same steel when tempered at different temperatures may exhibit equal hardness but vary in yield strength as much as 200,000 psi.

In toolsteels the amount of retained austenite affects the properties more than any other constituent. It lowers the yield strength and is otherwise a direct function of die hardness. The initial amount of retained austenite is governed by the hardening temperature.

Elimination of retained austenite by refrigeration treatment is only partially effective. Tests have indicated that at a temperature of −150° F. approximately 8% austenite remains. Lowering the temperature to −300° F. shows no further decrease. For steels having 40% or more retained austenite triple tempering is usually necessary to effect transformation.

Evaluating die steels by such mechanical properties as yield strength, hardness or impact values may give a false indication. Certain high-alloy steels may exhibit no difference in yield strength but vary immensely in plastic deformation properties. Also, certain steels may have a wide range of yield strengths without a change in hardness. This was explained graphically by Dr. Roberts by plotting yield strength against hardness of a group of die steels. The retained austenite in each steel lowered the proportional limit. However, when the austenite was eliminated each steel had the same proportional limit and followed the same curve.

Impact tests of high-alloy steels are unpredictable. Two steels with a ten-point spread in Rockwell C hardness may vary only 5 ft.lb. in impact strength. The best criterion for evaluating die steels by mechanical properties is the bend deflection test.

Wilson Meets Tulsa Chapter Officers

A. S. M. President Wilson Appeared Before the Tulsa Chapter in January. He presented a talk on "Current Developments in Alloy Constructional Steels", and discussed present and future aims of the Society. Pictured above are, from left: J. C. Holmberg, chapter chairman; Judge George E. Norvell, coffee speaker; Mr. Wilson; T. N. Duncan, vice-chairman; G. V. Bennett, secretary-treasurer; and J. H. Garrison, past chairman of the Tulsa Chapter. (Reported by Kenneth L. Kimball; photo by Wayne Hunt, Tulsa)

Potentials of Steel Industry Growth Predicted In Philadelphia Lecture

Reported by Charles C. Mathews

Joseph T. Ryerson & Son, Inc.

At the February meeting of the Philadelphia Chapter, Rufus E. Zimmerman of the United States Steel Corp. addressed a full house on the subject, "Waking Thoughts on the Steel Industry".

Mr. Zimmerman traced the modern history of the steel industry from the adoption of pneumatic refinement of iron by the iron masters of 100 years ago. He told how the development of openhearth furnaces to utilize increasingly large quantities of steel scrap, and the development of manganese additions to facilitate hot working of steel helped the infant steel industry to come of age.

The steel ingot capacity for 1953 is rated at approximately 117,500,000 tons, more than twice the annual production which satisfied the needs of the trade in 1941. New plants are being built in locations where they can cater to local markets. Recent figures indicated 28% of the U. S. population and only 17% of the steelmaking capacity was situated on the East Coast. These figures will be brought more in balance when the new Fairless Works of U.S. Steel swings into full production at Morrisville, Pa. National re-armament for the Korean war lit the fuse of expansion which a highly developed steel consuming industry already demanded.

Construction of the Fairless Works started in March 1951, and more than 325,000 tons of steel were required for buildings and equipment at this fully integrated steel mill.

Mr. Zimmerman discussed atomic fuel possibilities for the generation of electric power for the steel industry. Atomic reactors, he indicated, would be economically feasible only for large plants producing fissionable products where the generation of electric power could be a byproduct.

Precious Metals Subject Of New York Meeting

Reported by I. M. Hymes

Technical Engineer
International Business Machines Corp.

The February meeting of the New York Chapter featured a talk on "Precious Metals" by E. M. Wise, International Nickel Co. In his story about the precious metals, Mr. Wise brought out a number of points that have interested him in his years of research on the subject.

To prevent embrittlement of platinum during melting, the speaker suggested a slightly oxidizing flame be used. Embrittling of palladium occurs with the use of silicon carbide.

Past Chairmen Honored at Los Alamos

The Los Alamos Chapter Held Its First Past Chairmen's Night in January. Bruce A. Rogers, Institute for Atomic Research (Center), spoke on "Formation of Eutectoids in Zirconium Alloys", stressing the need for more research on the nature of the eutectoid decomposition in the zirconium-thorium and zirconium-molybdenum systems. Shown with Dr. Rogers are, from left: past chairmen F. Kubosch, J. M. Taub and A. S. Coffinberry, Los Alamos Scientific Laboratory; present chairman F. H. Ellinger; and past chairman C. G. Hoffman, also from Los Alamos Scientific Laboratory. (Reported by R. O. Elliott, Metallurgist, Los Alamos Scientific Laboratory)

Tells How Rare Earth Additions Improve the Properties of Steel

Reported by John A. Rassenfoss
American Steel Foundries

G. A. Lillieqvist opened the 1952-53 meeting season of the Calumet Chapter with a talk on "The Effect of Rare Earth Additions on the Properties of Cast Steels".

Mr. Lillieqvist, research director at American Steel Foundries, told of the many unusual properties given to cast steels by additions of rare earth metals. Extensive work on the laboratory level followed by plant scale experiments in production plants has demonstrated that rare earth additions significantly improve room temperature ductility properties of tensile test coupons.

Perhaps the most significant improvement in mechanical properties is that of Charpy V-notch impact strength at both room and −40° F. testing temperatures. It was demonstrated that the most striking benefits were realized in a quenched and tempered low alloy steel. When normalized and tempered, this alloy, a 0.30% carbon, 1.60% manganese steel, had impact values at −40° F. of 7.8 and 9.4 ft.lb. respectively, when untreated and treated with 2 lb. of LanCerAmp per ton. When this steel was water quenched and tempered to the level of 25,000 psi., the untreated and treated impact values at −40° F. were 23.8 and 34.8 ft.lb.

Noticeable improvements in the foundry characteristics of steels are also obtained with such rare earth additions. Both the fluidity and resistance to hot tearing of plain carbon and low alloy steels are markedly increased by the small additions which have been shown to improve notched impact results.

Experiments also indicate that these same additions of LanCerAmp, a commercial rare earth alloy, are about as effective as similar amounts of aluminum in preventing porosity occurrence when steel is cast in sand molds.

Photography Described as A Tool for Industrial Use

Reported by Alan F. Snow
Westinghouse Electric Corp.

The Northwestern Pennsylvania Chapter invited members of two local Camera Clubs to hear John H. Niemyer, Eastman Kodak Co., Industrial Sales Division, give a talk on "Photography in Industry" in February.

Mr. Niemyer used about 75 slides with his talk, emphasizing that photography was increasingly being used as a tool in industry. Many examples were shown, not only of photo reproductive processes in connection with drawings, templates and records, but of special ways in which photography is useful, particularly with polarized, infrared, and ultraviolet light sources.

The program was concluded with training films which showed a spectacular sequence, shot from the tail of a rocket, from take-off to a point 70 miles above the earth's surface. This film illustrated vividly the possibilities of machine or process analysis due to the capacity of movies to speed up or slow down actions.

Georgia Presenting Educational Sessions

An educational lecture series on "Shop Level Metallurgy" by Robert J. Raudebaugh, Georgia Institute of Technology, is currently being given to the members and guests of the Georgia Chapter in the Atlantic Steel Co.'s auditorium. This special 3-course session is designed to give basic information on metalworking and the principles that apply to most operations pertinent to Atlanta plants. Dates of meetings are Mar. 17, 24 and 31, and the same course will be repeated in April.

Foretells Casting Processes Revolution

Harry H. Harris, President of the General Alloys Co., Spoke on the "Impending Revolution in Casting Processes" at the January Meeting of the Worcester Chapter. Shown above are, from left: James F. Dempsey, Bay State Abrasive Products Co., technical chairman; Mr. Harris; Wenddell J. Johnson, Massachusetts Steel Treating Corp., chairman; and Harold J. Elmendorf, American Steel and Wire Co., program chairman. Mr. Harris illustrated his lecture with slides of castings and casting processes. (Reported by C. Weston Russell, Chemist, Wyman-Gordon Co.)

Speaker Outlines Metallurgical Progress Of Canada in Montreal

Reported by K. W. Shaw
Imperial Oxygen, Ltd.

J. C. Convey of the Department of Mines and Technical Surveys, Ottawa, spoke on "General Metallurgical Developments in Canada" before the November meeting of the Montreal Chapter.

The accelerated growth of metal production has given us more metal in the last 50 years than in all the previous years of man's existence. To keep up with this output, technical and scientific knowledge has become more and more essential, so much so that the metallurgist today must have a good background of fundamental science in addition to his metallurgical training.

J. C. Convey

Although technical advances have for the most part been made by empirical methods, experiments guided by some theory based on research effort have frequently provided profitable results.

Today team action in research is the keyword for the creation of conditions whereby the prospect of success in problematic situations becomes hopeful.

In Canada team action in metallurgical research is very evident. There exists a close liaison between private industry, government and university institutions. Examples of such teamwork are found in the production of titanium, in which cooperation from the ore to finished product is achieved through the group effort of the Quebec Iron and Titanium Corp., Dominion Magnesium, Ltd., the Mines Branch of the Department of Mines and Technical Surveys, in Ottawa and Quebec, the Defense Research Board, the University of Toronto, and Ecole Polytechnique.

In the desulphurization of steel, the Steel Castings Institute of Canada and the Mines Branch of the Department of Mines and Technical Surveys developed a magnesium-aluminum alloy to be added in ladle, which also serves as a conservative of manganese.

Mr. Convey discussed other subjects, particularly atomic energy, which has revived interest in lesser known metals, and nodular iron, boron steels, controlled density steel, and low-temperature welding.

An interesting question and answer period followed Mr. Convey's lecture.

Design in Metallurgy Topic at Worcester

Leaders at the Worcester Chapter Meeting in February Were, From Left: Herbert D. Berry, Assistant Manager, Thomas Smith Co., Technical Chairman; H. R. Neifert, Timken Roller Bearing Co., Who Spoke on the "Relation of Metallurgy and Design"; Wendell J. Johnson, Massachusetts Steel Treating Corp., Chairman; and Harold J. Elmendorf, Chief Spring Engineer, American Steel and Wire Co., Program Chairman. (Reported by C. W. Russell)

Use of Boron Substitutes For Critical Materials Outlined at Notre Dame

Reported by R. C. Pocock
Chief Engineer, Research Laboratory Bendix Products Div.

At the February meeting of the Notre Dame Chapter, H. B. Knowlton of International Harvester Co., reminisced of his early experiences in heat treating and metallurgy. He is a true old-timer who has seen the industry grow from its crude beginning when heat treat furnaces were hand-fired with coal and no one knew just what to expect from an alloy, to the wonderful instrumentation and technical knowledge available today. Mr. Knowlton gave A.S.M. full credit for its part in this development and encouraged student members present to become active in this organization and take advantage of the technical information available from the meetings and the Society's publications.

As chief engineer of the materials engineering section at International Harvester, Mr. Knowlton has had to dig in and find substitutes for critical materials. His talk dealt largely with the company's solution to this vexing problem. As a result of research, the company has eliminated 97% of the nickel and 69% of the molybdenum previously used in their alloys, and has been turning out as good and sometimes better products. Savings of 92,300 lb. of nickel and 23,150 lb. of molybdenum, vitally needed elsewhere, were realized. These savings were brought about primarily by changing to boron steels, and Mr. Knowlton stressed the point that a proper understanding of the properties required of a particular application has made substitution possible. As a challenge to metallurgists, he suggested that their troubles were largely of their own making and, if they would only get out of their rut, they could in many cases substitute other or better materials, as has been done at Harvester. He admitted that there were often added machining difficulties with case hardening grades which had to be overcome, but so far at Harvester they have always managed to come up with a solution.

Mr. Knowlton's talk was supplemented with slides giving the physical properties of the steels used and illustrating how they were able to make these substitutions. He pointed out that the great expansion in the steel industry, with an expected production of 114 to 119 million tons in 1953, make this substitution of nickel and molybdenum in noncritical materials absolutely necessary if we are to maintain the high quality of our defense material.

Ten Year Ago

Quotes From *Metals Review*
March 1943

"C. L. HIBERT of Consolidated Aircraft Corp. is chairman of the San Diego Chapter, one of the latest additions to the rapidly growing list of A.S.M. chapters."

—10—

"Election of BRADLEY STOUGHTON to the Board of Trustees of Lukens Steel Co., Coatesville, Pa., was announced recently . . . Dr. Stoughton is perhaps best known as professor of metallurgy at Lehigh University since 1923 and dean of the college of engineering until 1939."

Reviews U.S. Steelmaking Processes

In a Talk Before Lehigh Valley Chapter in February, John S. Marsh (Left), Research Engineer, Bethlehem Steel Co., Spoke on "Progress in Steelmaking Processes in America". This talk summed up observations made by Mr. Marsh in an article published in Metal Progress *in January. Shown with Mr. Marsh are George E. Brumbach, technical chairman, and W. N. Rice, chairman. The Chapter observed Bradley Stoughton Night and Past Chairmen's Night at the February meeting. (Reported by D. A. Lamb, Ingersoll-Rand Co.)*

Symposium Scheduled By Indiana Chapters

Responding to the nation's critical need for new metals and improved alloys both for defense and peacetime uses, the top engineering men in Indiana's important industries will meet at Purdue University on Apr. 25 for an all-day symposium on "Modern Physical Metallurgy".

The meeting is being sponsored by the seven Indiana chapters of the American Society for Metals, representing nearly 600 metallurgical engineers of the Hoosier State.

Participating in this Fifth Annual Spring Symposium of the Indiana Chapters are Calumet, Fort Wayne, Indianapolis, Muncie, Notre Dame, Purdue and Terre Haute. Technical chairman of the meeting will be James B. Austin, A.S.M. vice-president, and director of research laboratories, United States Steel Corp.

Program discussions will include the following topics and speakers:

"Evolution of Physical Metallurgy", by Arthur E. Focke, director, materials development, Aircraft Nuclear Propulsion Project, General Electric Co.

"Aluminum — Today and Tomorrow", by John R. Willard, manager sales development division, Aluminum Co. of America.

"The Present and Future of Ferrous Metals", by Arthur R. Lytle, director of research, Union Carbide and Carbon Laboratories.

There will be group discussions, special luncheons, and question and answer periods in connection with each of the discussions. The state-wide symposium of the Indiana A.S.M. Chapters will be open to all metallurgists, engineers and students.

Northern Ontario Hears Talk on Today's Rails

Reported by J. B. McNichol

Metallurgist
Algoma Steel Corp., Ltd.

The Northern Ontario Chapter heard Ralph W. Dickson, divisional superintendent of the West Mills, Gary Steel Works, United States Steel Corp., give a talk on "Today's Rails" at its February meeting. His talk proved especially interesting to those members associated with the production of rails at Algoma Steel Corp.

Railroading and railmaking is still big business all over the world, Mr. Dickson stated. He gave a historical outline, tracing the progress from the first rail down to the modern rail sections in use today. The first rails were made of wood, a far cry from the specialized steel product of our modern rolling mills. The first metal rail was a cast iron plate known as "strap rail". Design, length, and weight changes over the years were noted and illustrated by the speaker, who stated that today we produce more than 100 different rail sections ranging in weight from 60 to 155 lb. per yd.

Rail failures in the past have been due to such phenomena as transverse fissures and shelling. Continual investigation by metallurgists has resulted in a solution to the transverse fissure problem. It was found that hydrogen was causing shatter cracking, but controlled cooling of rails has eliminated that danger. Experimentation into the value of alloy steels for rails as a possible solution for shelling is now in progress.

Mr. Dickson gave a resume of rail production at the Gary Steel Works. He traced the production of a rail from the openhearth through the soaking pits and rolling mills to the final product. Methods in use at Gary were compared with those used by Algoma. Rails are slow cooled in insulated box cars at Gary, whereas the steel is cooled in special tanks at Algoma. The Gary plant does not use any intermediate heating of the rails; Algoma uses a reheating furnace in the production line. Rigidly controlled quality practices at Gary produce 93% first quality rails.

Mr. Dickson closed by saying that perfection has not yet been reached and that more research into quality and design by our metallurgists and engineers will produce better rails.

Compliments

To ROBERT F. MEHL, director of the Metals Research Laboratory and head of the metallurgical engineering department at Carnegie Institute of Technology, on being chosen to deliver a lecture on "Metals and Crystals" before the Royal Canadian Institute in Toronto.

♦ ♦ ♦

To ROBERT J. PROUT, who was recently transferred to U. S. Steel Corp.'s Torrance (Calif.) Works as general supervisor of metallurgy. Mr. Prout, chairman of the Utah Chapter A.S.M., was voted honorary chairman by the Chapter's Executive Committee which refused to accept his resignation.

♦ ♦ ♦

To PAUL G. BASTIEN on his award of the V. Noury Prize by the Institut de France (Academy of Sciences) for his contribution to metallographic research.

♦ ♦ ♦

To the MILWAUKEE CHAPTER A.S.M. on the newspaper coverage they obtained publicizing the Foundation for Education and Research. A lengthy article entitled "Metals Society Backs Vital Training Plan" appeared in the *Milwaukee Journal*, Dec. 21, 1952.

♦ ♦ ♦

To H. HUGHES WHITE, who is *not* seeking re-election to the presidency of the Verona (N. J.) Board of Education, a job he has had for the past six years, because, as vice-chairman of the New Jersey Chapter A.S.M., he feels he should not divide his efforts between the two jobs.

♦ ♦ ♦

To CHARLES E. REARDON, service metallurgist for the United States Steel Corp., on his re-appointment as consultant to the Metallurgical and Conservation Branch of the National Production Authority. Mr. Reardon has been a member of A.S.M. since 1926 and has served on the executive committee of the Chicago Chapter.

Chapters Report Success in Year's Educational Series

Practically all of the chapters of the American Society for Metals have presented series of educational courses throughout the current season, and from each has come reports of enthusiastic support and record attendances. A wide variety of subjects has been covered in these numerous courses, each of which offered discussions by distinguished men in the fields covered. Just how much metallurgy can be covered in the short space of time allotted to each course can be observed by the following Chapter's schedules.

BUFFALO — "Nondestructive Inspection and Testing", a series of three lectures on "Seeing Isn't Always Believing", in which inspection instruments were covered; "Magnetic Analysis Inspection for Nondestructive Testing of Ferrous and Nonferrous Materials"; "Sonometer As Used in Determining Young's Modulus of Solid Materials" and "Ultrasonic Testing".

DETROIT—A series of three lectures, supplemented with slides, on material included in the text Inspection of Metals by H. B. Pulsifer.

LOUISVILLE — Four lectures on "Surface Finishing", covering cleaning treatments, chemical treatments, electrolytic finishing and organic finishes.

MAHONING VALLEY—Four lectures on "The ABC's of the Metallurgy of Iron and Steel" given by E. J. P. Fisher, a series aimed primarily at the untrained metallurgist.

MINNESOTA — "Machining of Metals" was considered in six lectures, the first two of which were designed to lay a foundation in the understanding of machining processes and structures of materials. Subsequent talks covered specific shop problems, and a summary of the material covered with related factors which influence the machining of metals, and specific shop problems.

NEW HAVEN—A course on "Failures in Metal", including lectures on "Mechanisms of Failures in Metals", "Corrosion and Embrittlement Failures", "Fatigue and Mechanical Failures", "Impact and Low-Temperature Properties", and "High-Temperature Failure".

NEW YORK—Four lectures on "The Science of Metals", to high school students to add to their general knowledge of metals.

OAK RIDGE—"Temperature Measurement in Welding Research" was considered in three lectures.

ONTARIO—A course in "Physical Metallurgy" was offered by the Department of University Extension of the University of Toronto. The course consisted of 20 lectures.

PHILADELPHIA—"Effective Technical Writing", a series of four lectures designed to bring the latest techniques and procedures in report writing to persons who write reports, read reports, or who are executives.

WORCESTER—A course for the "Man in the Shop" consisting of six lectures covering forgings, stampings, cast iron, cast steel, production steels, and toolsteels.

Tells How to Heat Treat Aluminum Alloys

E. H. Hollingsworth (Right), Who Spoke Before the New Haven Chapter in January, Is Shown With C. B. Christensen (Left), Chairman, and R. S. Pratt, Technical Chairman. Mr. Hollingsworth presentd an interesting discussion on "The Heat Treatment of Age Hardenable Aluminum Alloys"

Reported by G. F. Whiteley
Heppenstall Co.

E. H. Hollingsworth of the Aluminum Co. of America discussed "Heat Treatment of Age Hardenable Aluminum Alloys" at the January meeting of the New Haven Chapter.

The strongest aluminum alloys are age hardenable. They are important commercially in aluminum products used for structural applications and aircraft. Age hardenable aluminum alloys may receive a number of heat treatments, such as preheating to homogenize the ingot and eliminate the as-cast structure so the ingot can be hot worked satisfactorily, solution heat treatment to dissolve the soluble constituents and to retain these constituents in supersaturated solid solution, or precipitation heat treatment to decompose the supersaturated solid solution and cause hardening more rapidly than by natural aging.

Several difficulties may arise in solution heat treating. The temperature may be too low or the period too short so incomplete or insufficient solution of the soluble constituents may result. If the temperature is too high melting may result. Sometimes, if the furnace atmosphere contains moisture or even traces of sulfur compounds, a type of high-temperature corrosion, commonly called high-temperature oxidation, may result. The quenching rate also has a pronounced effect. Changing the rate of cooling for different alloys can affect amount of distortion, residual stresses, mechanical properties, and resistance to corrosion of a part.

Dr. Hollingsworth noted that heat treatment of clad products is complicated by factors in addition to those which must be considered in heat treating nonclad products. He discussed annealing and the precautions that must be observed when retreating cold worked and naturally aged alloys.

IMPORTANT MEETINGS *for May*

May 1—American Association of Spectrographers. Symposium. Chicago, Ill. (J. P. Pagliassotti, A.A.S., Box 431, Whiting, Ind.)

May 6-7—National Metal Trades Association. Mid-Atlantic Assembly. Bellevue-Stratford, New York. (C. L. Blatchford, Secretary, N.M.T.A., 122 S. Michigan Ave., Chicago 3, Ill.)

May 18-22—Materials Handling Institute. National Materials Handling Exposition, Convention Hall, Philadelphia. (Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y.)

May 18-23—Comite Francais D'Electrothermie. III Congres International D'Electrothermie, Paris. (Comite Francais D'Electrothermie, 2. rue Henri-Rochefort, Paris 17, France).

May 20-22—Society of Photographic Engineers. Third Annual Conference, Hotel Thayer, West Point, N. Y. (L. A. Root, Conference Committee, S.P.E., 37-01 31st St., Long Island City, N. Y.

May 20-22—Society for Experimental Stress Analysis. Spring Meeting. Hotel Schroeder, Milwaukee, Wis. (W. M. Murray, S.E.S.A., Central Square Station, P. O. Box 168, Cambridge 39, Mass.)

May 24-28 — Scientific Apparatus Makers Association. Annual Meeting. The Greenbrier, White Sulphur Springs, W. Va. (D. F. McCammon, S.A.M.A., 20 North Wacker Drive, Chicago 6, Ill.)

New Films

Right as Rain

A sales-promotion picture sponsored by the Aluminum Co. of America which carries the story of irrigation theory and practice directly to the customer and prospects for aluminum irrigation equipment. For further information write to: Wilding Picture Productions, Inc., 310-1010 Euclid Bldg., Cleveland 15, Ohio.

Lightning Masters

A new 30-minute full color sound film which depicts the phenomena of natural lightning and tells a story of lightning research and the development of modern protective equipment. The film has been produced by the General Electric Co.'s Distribution Transformer Dept., Pittsfield, Mass. Further information may be obtained by writing to the General Electric Co., Schenectady 5, N. Y.

Meeting the Challenge and By Way of Experience

Two fast-moving color motion pictures produced by National Carbon Co., which describe and demonstrate the nature, uses and practical installation of the company's "Karbate" impervious graphite corrosion resistant equipment. Prints are available on loan to plants, schools and technical societies. Write: M. E. Thompson, William Esty Co., Inc., 100 East 42nd St., New York 17.

Inland Empire Holds Educational Lectures

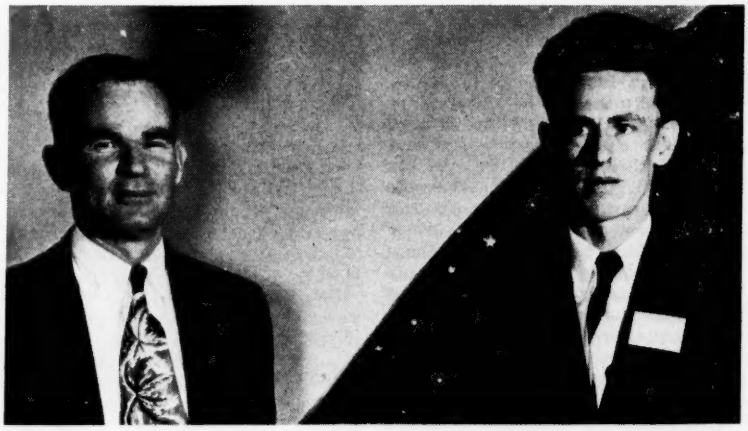
Reported by F. R. Morral
Kaiser Aluminum & Chemical Corp.

The opening session of the Inland Empire's current educational series of lectures on "Aluminum and Its Alloys" was held at Gonzaga University, and was lead by Dana W. Smith, assistant director, division of metallurgical research, Kaiser Aluminum & Chemical Corp., who spoke on "Introduction to the Aluminum Industy".

Dr. Smith covered the early history, starting with 1746 when Marggrof produced aluminum oxide, and step-by-step took the audience from 1852, when the metal cost $545 per lb., to the present, desribing in particular the development of the industry in the U.S. Aluminum ore and its processing, reduction process, melting, alloying, casting and fabrication were briefly covered to give the audience a bird's-eye view of the present status of the industry.

Because of the large number of registrations (153) for the course, the Chapter will hold future educational meetings in larger quarters, at the Lewis and Clark High School.

Talks on Stress Analysis at Oak Ridge



William T. Bean, Jr. (Left), Who Talked on "Stress Analysis and Interpretation of Results" at the Oak Ridge Chapter February Meeting Is Shown With R. G. Klipple, Technical Chairman, at the Speaker's Rostrum

Reported by David L. McElroy
Graduate Student
University of Tennessee

"Stress Analysis and Interpretation of Results" was the subject of the talk by W. T. Bean, Jr., consultant, at the February meeting of the Oak Ridge Chapter.

Mr. Bean stated that the correct engineering approach along with realization of the limits of handbook data, utilization of trade knowledge of the properties of materials, and alertness are all helpful in evaluating and overcoming ignorance in stress analysis.

Photo-elasticity, stress coat, enamel coating for thermal stresses, and strain gages are common tools used in stress analysis. Mr. Bean exhibited a slip ring device of his own design which he has found very applicable in torsion analysis problems. Emphasis was placed on the use of test specimens from the actual finished product, especially in destructive tests which are useful in stress analysis. Multichannel recorders, recording galvanometers with amplifying circuits, and high-speed timers have been instrumental in evaluating the actual strains picked up by the gages on the test specimen in many failure problems. Results of detective work on failure have revealed some of the causes of failure to be associated with stress raisers, inclusions, order of product processing, and stresses caused by vibrations, poor heat treating processes, inertia forces and improper design geometry.

Mr. Bean illustrated how designing can be a science in producing a commercially acceptable product if such variables as basic forces, load cycles, pattern geometry, critical point stress analysis, and other laboratory tests are properly evaluated.

Inland Empire Chapter Tours Defense Plant

Reported by Helen Goerig
Kaiser Aluminum & Chemical Corp.

In February the Inland Empire Chapter was privileged to be the guest of Columbia Electric & Manufacturing Co., Spokane. A conducted tour through their new plant, designed from both an artistic and efficiency viewpoint, showed how ammunition parts are manufactured from rod metals to finished products.

By way of background, Walter Toly, president, presented a talk about the birth of the Columbia Electric from modest circumstances in 1940 to its present status of big business. Although today the company is one of the nation's leaders in commercial and industrial lighting, the period immediately following VJ-Day was one of trial and experiment. Many ideas, such as an aluminum mail box, which resulted in nation-wide sales, aided in the reconversion to successful postwar business.

The tour was conducted with small groups and the mechanics of production were described and demonstrated from the initial forming of the parts by automatic screw machines to the final inspection of the object.

Columbia Electric's personnel, produce the M21A4 booster for artillery shells, 20 mm. projectile, and fin assemblies for 60 mm. shell mortars.

The evening ended with a question period in Mr. Toly's office which displayed the new ultramodern lighting arrangement developed by Columbia Electric. The ceiling and light source are made of plastic louvers with aluminum supports which hide the electric fixtures and other services. Light intensity can, by finger touch, be controlled between night-club dimness to sunlight brightness without affecting the eyes.

Tool Failures and Troubleshooting Analyzed at Meeting

Reported by L. A. Hurwitz

Chief Metallurgist
Hamilton Watch Co.

J. Y. Riedel, toolsteel engineer for the Bethlehem Steel Co., addressed a joint meeting of the York Chapters of A.S.M. and A.S.T.E. in January. He spoke on "Tool Failures and Tool Troubleshooting".

An analysis was made of many types of tool failures, with photographs and facts relating to each one selected to illustrate actual case histories.

The fundamental factors contributing to successful toolmaking are: good design, sound toolsteel of the proper grade, correct heat treatment, proper grinding, and proper application of the tool. Each of these factors must be given proper attention in order to achieve the best possible tool performance.

Design faults which cause failures in heat treatment are heavy sections adjacent to light sections and sharp corners. Design faults causing service failures are the failure to fillet corners, use of fillets instead of tapers, failure to provide proper tool clearances and design overloads.

In spite of the extreme care used in the manufacture and inspection of toolsteel, the customer occasionally encounters material containing some defect. The most common ones are voids, streaks due to segregation, inclusions and surface laps, tears, flakes or internal cooling cracks and surface cooling cracks occurring on air hardening steels.

A large percentage of tool failures result from faulty heat treatment. The investigation of failed tools should always be started by reviewing the heat treatment operations. The structures of toolsteels as seen under the microscope often have characteristic appearances which change markedly with variation in heat treatment. The microstructure of a tool often furnishes infallible evidence as to its previous thermal history.

In grinding hardened tools, localized heating of the metal occurs under the action of the abrasive. As a result, very high surface stresses may be set up and in a highly stressed hardened tool may cause cracks or checks. Common grinding faults are scorching (by removing metal too rapidly), grinding with a dull or loaded wheel, grinding with a wheel or grit-size too fine for the job, and ineffective use of coolant.

Tools made of the proper grade of sound steel may be well designed, heat treated and ground, and still fail prematurely in service because of mechanical factors or improper operation. The true cause of many tool failures cannot be found unless investigation is made of the conditions under which the tool was used. There are a number of purely mechanical factors which cause tool failures, such as overloading by accident, two multiples going into a forming die, excessive stress concentration, and improper clearances and alignments.

The Tool Steel Troubleshooter, a practical handbook published by the Bethlehem Steel Co. to help identify and correct the most frequent causes of tool and die failures, was distributed after the meeting.

Ladies Night at Mahoning

Reported by Eugene M. Smith

Development Engineer
Youngstown Sheet and Tube Co.

The Mahoning Valley Chapter selected Valentine's Night to entertain their wives and sweethearts at their annual Ladies Night. The evening of fun for the ladies was planned by Paul Kelley, Ohio Works of the U. S. Steel Corp., social chairman. The evening included a cocktail party, a turkey dinner, entertainment and dancing.

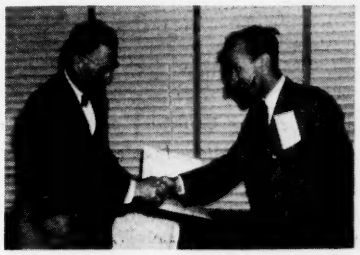
Memorial Lecture Details Progress in Research

Reported by J. H. Schaum

Metallurgist
National Bureau of Standards

The Washington Chapter presented its fourth George Kimball Burgess Memorial Award Lecture in February. Samuel L. Hoyt, technical advisor, Battelle Memorial Institute, spoke on "Industrial Research as an Industry Tool".

The George Kimball Burgess Lecture honors Dr. Burgess, an eminent metallurgist who was a past national president of the Society, and a former director at the National Bureau of Standards.



Samuel L. Hoyt (Left) Is Presented the Burgess Memorial Award Certificate by Gene Olcott, Chairman of the Washington Chapter, at the February meeting. (Photo by D. Ballard)

The speaker traced the history of science through the eras of the Roman craftsmen, the late Renaissance, the Industrial Revolution, and down to the present. He emphasized that basic research gives to scientists the seeds which applied research plants, grows, and causes to bear fruit.

Beginning about 1900 the electrical industry began to conduct research as we know it today. The chemical, automotive and aircraft industries soon followed suit. The speaker pointed out how Dr. Burgess had contributed materially and quietly to the advancement of applied research during this present era of growth.

Kropp Expands

Kropp Forge Co. has initiated a major program for manufacturing titanium parts for Army ordnance. The company already has a well-developed program for many important aircraft parts of titanium such as landing gear forgings, structural members and jet engine parts. To facilitate the later undertaking, the main plant in Chicago has been equipped with a variety of new equipment, including a 40,000-lb. drop forge hammer, a 4000-ton forging press, additional furnaces for heating metals to forging temperature, more die sinking facilities and handling apparatus.

ASM-AWS Hold Joint Meeting in Tulsa

Pictured at the Joint Meeting of the Tulsa Chapters of the American Society for Metals and the American Welding Society in February Are, From Left: John Tipton, A.W.S. Chairman; J. C. Holmberg, A. S. M. Chairman; Robert E. Miller, Greb X-Ray Co., Speaker; and James B. Davis, A.S.M. Mr. Miller presented a talk on "Industrial X-Rays". (Reported by G. V. Bennett)

Carolinas Hear Silver Soldering Talk

Shown at the February Meeting of the Carolinas Chapter Are, From Left: A. R. Fairchild, Western Electric Co., Inc., Chapter Chairman; Sam McCaulley, District Sales Manager, American Platinum Works, Speaker; and W. R. James, Edgcomb Steel Co. Mr. McCaulley outlined the techniques involved in "Silver Soldering" in a well-illustrated lecture

Reported by Moss V. Davis

Metallurgical Engineer
Western Electric Co., Inc.

In a talk before the February meeting of the Carolinas Chapter, Sam McCaulley, district sales manager of the American Platinum Works, outlined the techniques of "Silver Soldering". His talk was illustrated with many well-chosen charts to bring out the important points.

Mr. McCaulley deemed it important to begin his talk with a review of the definitions of the terms welding, brazing, and soldering. He pointed out that welding involved the fusion of the two pieces of metal being joined with the welding rod, whereas the brazing process involved the penetration of the alloy used into the two pieces being joined, the pieces being held together by the bonding between the alloy and the metal being joined. In soldering, there is much less penetration and alloying with the metal being joined, the bonding between the metal and the solder being of a different type than brazed pieces, and having, in general, less strength.

It was pointed out that silver "soldering" is a misnomer, as in reality it is actually a brazing process and should be termed silver brazing instead. Of the large number of silver alloys known to be useful in silver soldering, only 20 are used to any extent industrially. Mr. McCaulley reported that only in the last decade had silver solder come into its own in industry. Its wide use is coming about through the demand for joints between materials that must be held to very close tolerances, the silver solder being able to join the pieces with a minimum distortion, and, in the case of electronic equipment, without impairing the electrical conductivity of the joined pieces.

With the aid of charts, the proper techniques of joining similar and dissimilar metals were outlined in some detail. The techniques of joining flanges to close tolerance tubing by silver solder so that no distortion occurs was explained. Among the topics stressed in the talk were the importance of uniformly heated parts, proper fluxing of the parts, and application of the solder so that it would flow around the joint by capillary action, sweeping before it the flux-containing trapped air and oxides, avoiding a defective joint.

Silver solder may be applied in a variety of ways, including oxyacetylene torch, induction heating of the parts to be joined using preformed rings of silver solder to give the correct amount of solder necessary to join the parts, by heating the parts in a salt bath using preformed rings or feeding the solder into the joint, or by furnace heating of the parts and using preformed rings of silver solder. The latter methods assure parts being at uniform temperature.

Specific examples where silver solder had been used to do a job where other means had failed and where silver solder had improved the quality and quantity of certain processes were described.

Dr. Fulmer of Iowa Dies

Ellis I. Fulmer, assistant to the director of the Iowa State College Institute for Atomic Research and the Ames Laboratory of the Atomic Energy Commission, died in February following a heart attack. Dr. Fulmer had been affiliated with the department of chemistry at Iowa State College since 1919 and with the Institute since its inception in 1947.

Lindberg Opens New Plant

Lindberg Engineering Co., Chicago, opened a new West Coast plant in Downey, Calif., on March 25th.

This new factory comprises 12,000 sq. ft. of production and office space and will be used to manufacture industrial heat treating furnaces and other Lindberg products used in aircraft and other vital industries.

It's a Laughing Matter in Boston

Thoroughly Enjoying Their After-Dinner Chat During the February Meeting of the Boston Chapter Are, From Left: William L. Badger, Chapter chairman; R. L. Wilson, A.S.M. National President, Who Talked on "Current Developments in Alloy Constructional Steels", and S. H. Baylor, Technical Chairman

Traces Ironworking History of America Back to Vikings

Reported by A. E. Leach
Metallurgist, Bell Aircraft Co.

The first ironworking on the North American continent is believed to have been done by the Vikings in precolonial times. George A. Ellinger, chief of the Corrosion Section of the National Bureau of Standards, took the Buffalo Chapter on a metallurgical tour of history at the February meeting when he reported on his examinations of Viking weapon and tool remnants found on this continent in a talk on "Metallography of Some American Iron Artifacts".

The influence of the Vikings was felt throughout the known world early in the Christian era. As the Roman Empire deteriorated, they conquered large sections of Eastern and Western Europe, and their mastery of seamanship took them to parts of the world then unknown to civilized peoples. However, since they were more interested in making history than recording it, many of their exploits remain unknown. In modern times their tools and weapons have been found in Newfoundland, Virginia, and as far west as Wisconsin and Minnesota. These artifacts have been dated at about 1200 A.D. Remains of furnaces indicate that ironworking was known here before colonial settlement.

The ores available to the Vikings were a low-grade limonite, containing high phosphorous, and a high-grade magnetite. Charcoal was used as a fuel and the final products were a soft, wrought iron. Viking artifacts found on this continent have been of either high phosphorous (approximately 0.50%) or low phosphorous (approximately 0.03%), and it is interesting to note that invariably the high-phosphorous articles are in a better state of preservation. Apparently a corrosion product has protected them against further attack. In all cases, quantities of nonmetallic stringers were found in their microstructures.

Many stone hammers have been found at the sites of Viking ironworks but never iron hammers. This points to the softness of their iron which could not be used for forging.

The technique of strengthening iron with carbon was not mastered by the Vikings but was in general use in Southern European countries. Apparently considerable quantities of this high-carbon iron were obtained by the Vikings, for many of their spikes, nails, and tools had the typical soft wrought iron as a core with high-carbon iron welded to the surfaces to make them more durable. For instance, an axe found in Newfoundland, dated 1200 A.D., had a high-carbon insert at the cutting edge. Their hammer welding was very good in most cases. Carbon had diffused into the soft core and there was no clear boundary between high-carbon and low-carbon materials.

The microstructures of the wrought iron articles often showed a needle-like constituent which has not been identified. Sometimes Neumann bands are found, indicating that the artifacts were cold worked.

Lehigh Holds Young Scientists Night

Shown at Lehigh Valley Chapter's Future Scientists of America Night in January Are, From Left: George P. Witteman, Technical Chairman of the Meeting; Harold J. Babcock, Speaker; Richard Steyert, Winner of First-Place Science Achievement Award; and William N. Rice, Chapter Chairman

Reported by D. A. Lamb
Metallurgical Department
Ingersoll-Rand Co.

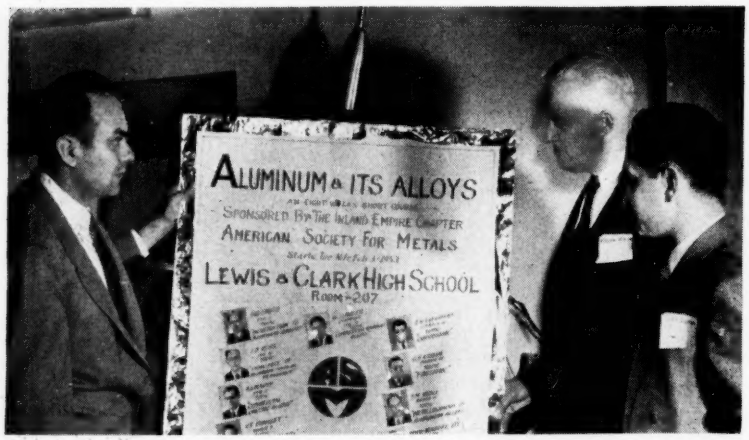
The Lehigh Valley Chapter observed Future Scientists of America Night in January in accordance with A.S.M.'s current endeavor to stimulate and foster scientific interest among high school students. Chapter members invited a sizeable group of young men from various secondary schools in the locality to attend this meeting as their guests. The program for the evening included a talk on "Squirting Commercially Useful Shapes From Cold Steel" by Harold J. Babcock, chief metallurgist, artillery ammunition department, Frankford Arsenal, and a resume of a process for "Obtaining Magnesium From Sea Water" by Richard Steyert, 16-year old Allentown, Pa., high school student. This double feature was well received and seemed to indicate that future similar efforts directed toward the younger element would be well worthwhile.

Mr. Babcock traced the shaping of metals by extrusion from early applications dating over 150 years ago to modern times. An excellent set of slides clearly illustrated the basic mechanical features involved in both the forward and indirect methods of shaping metals by extrusion. Points emphasized as being prerequisite to the success of this fabrication technique included punch and die materials and design, necessity for correct lubricants, degree of reduction, and development of adequate capacity presses for such service.

The cold extrusion process boasts considerable economic advantages over the conventional deep drawing method of fabrication as applied to such articles as shell cases and other tubular parts. Cold extrusion allows the use of relatively inexpensive low carbon steel, and excellent physical properties are developed which eliminate the necessity for higher priced and perhaps critical alloys that require heat treatment after the conventional deep drawing process. The process eliminates many of the process anneal heat treating operations, with pickling and cleaning, that accompany processing of drawn parts, and reduces the amount of machining necessary to complete the finished article, since cold extrusions can be held to very close tolerances. The process also lowers over-all initial cost of equipment for a given operation.

The resume of the award-winning project "Obtaining Magnesium From Sea Water" by Richard Steyert included an outline of the pilot plant model which he had set up for this experiment. The work was done during spare afternoon and evening hours, and won a first-place national award during the 1952 Science Achievement Award program sponsored by the Society. Much of the apparatus was tailor-made although a few of the more complicated pieces were borrowed from various outside sources. Some of the problems encountered in building the apparatus were described. The fact that this project was undertaken and successfully completed without benefit of any formal chemical training is particularly commendable. Richard's talk created a great deal of interest, especially among the younger people in the audience and constituted a real incentive for further achievements.

Educational Poster Interests Wilson


ALUMINUM & ITS ALLOYS
SPONSORED BY THE INLAND EMPIRE CHAPTER
AMERICAN SOCIETY FOR METALS
LEWIS & CLARK HIGH SCHOOL
ROOM-207

E. F. Morral (Left), in Charge of Educational Activities of the Inland Empire Chapter, Explains to Ralph L. Wilson, A. S. M. President, and Servet A. Duran (Right), Chairman, Details of the Chapter's Educational Course

Reported by **F. R. Morral**
X-Ray Department
Kaiser Aluminum & Chemical Corp.

Ralph L. Wilson, A.S.M. president, was the guest of honor at the March meeting of the Inland Empire Chapter. Students from Washington State College attended this meeting.

F. R. Morral reported on the Chapter's educational course on "Aluminum and Its Alloys", for which there have been 164 paid registrations. He pointed out that the registrants covered all walks of life from presidents, managers, superintendents, metallurgists, chemists, engineers, foremen, laborers to stenographers. He mentioned that two engineering students from Gonzaga's engineering school had registered and were attending the course. The educational activities of the Chapter also include presenting movies to high schools, both at grade and high school level, and activities in obtaining a council of professional societies in this area to promote science in the schools and to give an understanding to parents of the possibilities in that field for their children.

President Wilson spoke on "High Carbon Steels in Engineering Occupations", which has been reported elsewhere. He apologized for the selection of this topic to the light metals capital of the West. After defining the high carbon steels and their engineering fields he pointed out how the various types of steels overlapped and changes of application which have occurred with time.

Mr. Wilson toured the facilities of the Kaiser Aluminum & Chemical Corp. in the afternoon.

Radioactive Materials Featured at University Night in Detroit

Reported by **D. N. Frey**
Metallurgical Department
Ford Motor Co.

Henry Gomberg, professor at the University of Michigan, presented a lecture on "Industrial Applications of Radioactive Materials" at University Night of the Detroit Chapter. Student groups from various local colleges and universities were guests of the Chapter for the evening.

Prof. Gomberg outlined in general the nuclear origin of various types of radiation or energy given off by radioactive elements. He carefully described the characteristics of the various radiations and how they affect their possible applications and necessary measuring and detection apparatus.

He then classified industrial uses of radioactive materials into two groups: tracer applications, and utilization of the radiation to alter, accelerate or otherwise change chemical and biological reactions. The former group was illustrated with several medical examples of locating radioactive iodine in thyroid tissues and in tumor areas in the head. Also shown were autoradiographs of metallurgical samples at high magnification (100 and 1000 X). High resolution and selectivity were shown in delineating microconstituents in which were concentrated one or more radioactive element.

Prof. Gomberg has been especially active in developing the techniques for this type of autoradiographs.

In the latter group of industrial uses, attention was drawn to several examples of catalysis in chemical reactions by radioactive substances, as well as to recent developments in sterilization of trichina larvae in pork by radiation.

Explains New Ways To Manufacture Tubes

Reported by **E. L. Olcott**
U. S. Navy—Bureau of Ships

John J. B. Rutherford, chief metallurgist, Babcock and Wilcox Co., addressed the Washington Chapter in January on "Novel Methods in the Manufacture of Tubing".

Mr. Rutherford traced the history of tubing through its application for cannons, bicycles, oil refining equipment, and airplanes. Babcock and Wilcox's present tube capacity is about 20,000 tons per month. Mr. Rutherford showed pictures of electric furnace steelmaking, forging, piercing, rolling, cold drawing, and welding of steel for tubing.

He then described a continuous casting facility which can cast a round "bar" up to 90 ft. in length. Problems of slag separation, uniformity of composition, and pouring temperature have been given much attention and development work.

The "glass lubricant" extrusion equipment was described. Recent requirements for tubes of alloys difficult to handle in the conventional cone-type piercing mill have been successfully filled by the extrusion press.

Hartford Member Elected to Senate

William Purtell, a long-time member of the Hartford Chapter A.S.M., has been elected for a 6-year term as U. S. Senator from Connecticut. The Holo-Krome Screw Corp., Hartford, of which Senator Purtell was president, treasurer and general manager prior to resigning to run for public office, has been an active sustaining member of the Hartford Chapter since 1946.

Senator Purtell, who was born in Hartford in 1897, has been an active director and member of many civic, social and industrial societies. He is a former member of the United States Chamber of Commerce and former director of the Connecticut State Prison and Board of Parole.

Titanium Discussed At New Jersey Meeting

Reported by John L. Everhart
Materials & Methods

It costs from $50-$240 to save a pound by changing from steel to titanium, according to Herman H. Hanink, manager of the metallurgical engineering division, Wright Aeronautical Division, who spoke at the February meeting of the New Jersey Chapter. His topic was "Titanium—Applications and Fabrication".

The speaker delivered a thought-provoking talk on the advantages and limitations of titanium to a large and attentive audience. After reviewing briefly the development of titanium and its commercial alloys, Mr. Henink selected three of the latter for further comment.

For each, he discussed the effect of heat treatment on the properties and structure, illustrating his points with numerous slides. These alloys can be hardened by a combination of quenching and aging but each responds differently to heat treatment. Thus one attains its maximum hardness on aging at 500° F., another requires aging at 700° F., and the third, which is quite hard as cooled in air, does not harden appreciably on aging but will age harden when quenched to a soft structure. The speaker noted that the first two could be considered as water-hardening alloys and the third as an air-hardening alloy.

Unfortunately, hardness is not the only requirement of a material. Upon aging, all three alloys become extremely brittle and their properties in the fully aged condition are not suitable for commercial applications.

However, these alloys can be overaged to attain a hardness level similar to that obtained in a mill anneal. The combination of quenching and overaging gives a structure which is the most desirable for fatigue resistance, particularly in the presence of notches.

The fact that titanium alloys do not have attractive properties in the quenched and aged condition does not prevent their use. In the annealed or quenched and overaged condition, the room temperature mechanical properties are equivalent to those of several of the alloy steels at the hardness levels used in aircraft. Short-time strengths at elevated temperatures of these titanium alloys also compare favorably with the alloy steels and are superior to those of a typical aluminum alloy at temperatures above 350° F.

Creep strengths present a different picture. All of these titanium alloys creep at room temperature and will extend to rupture in 200 hr. at ordinary temperatures under loads equivalent to the 0.2% yield strength. It is doubtful whether the present alloys are suitable for service above 700° F.

Other factors which must be considered are those concerned with the fabrication of the materials. Although titanium and its alloys can be forged, costs are at least 50% higher than those for aircraft steels. While titanium can be welded, the alloys cannot—welds in the alloy grades are too brittle for commercial use. Machining is difficult and a reasonable estimate rates the cost at least twice that for an equivalent steel piece.

Titanium is in limited commercial use in certain aircraft applications but large scale application will occur only when price has been reduced considerably. Needed also are improvements in fabricating and machining methods. Although Wright Aeronautical has been investigating titanium since 1946, the metal is not used commercially in any Wright airplane engine.

Problems Involved in Heat Treating of Heavy Duty Gears

Reported by J. M. Hoegfeldt
Haynes Stellite Co.

Harold J. Bates, superintendent of metallurgy and inspection, Fairfield Manufacturing Co., addressed the Purdue Chapter on Sustaining Membership Night. Mr. Bates, Purdue Chapter's first chairman, spoke on "Today's Problems in the Heat Treatment of Heavy Duty Gears".

The major factors involved in the heat treatment of these gears are engineering design and requirement, or physical properties, materials, and proper heat treatment techniques considering materials used and properties desired.

Most heavy duty gears are made from low carbon alloy steels which are carburized and hardened. Requirements naturally vary from application to application, and the importance of the various quality factors change accordingly. One easily measured factor is hardness and hardenability, and the steels are often rated on this basis.

During World War II the gear manufacturing industry learned to work with and produce satisfactory gears from steels of much lower alloy content than previously used. After the war the industry was accustomed to use the new, cheaper alloys and only occasionally returned to prewar materials.

When the "police action" in Korea started, the gear manufacturers were again requested to use leaner alloys, and the search for satisfactory low alloy steels was again intensified. However, due to the previous cuts in the alloy contents, the search is encountering more difficulties this time.

Mr. Bates discussed the influence of various alloying elements, and paid particular attention to boron. The current heat treatment practices at the Fairfield Manufacturing Co., as modified to meet the requirements of the new steels, were outlined with the possibilities in research developments in the future.

Washington Holds Annual Meeting with A.W.S.

Reported by J. H. Schaum
Metallurgist
National Bureau of Standards

The Washington Chapter held its annual joint meeting with the local chapter of the American Welding Society in December. Vincent T. Malcolm, director of research, Chapman Valve Manufacturing Co., spoke on "Fabrication of High-Pressure, High-Temperature Alloy Steel Piping by Welding".

After reviewing the history of pipe welding, Mr. Malcolm discussed the characteristics of nine types of alloy steels currently in use for elevated temperature pressure piping. He emphasized the importance of preheating to prevent brittle welds, and equipment and procedure for preheating as well as postheating for stress relief.

Mr. Malcolm stated that steels must be rated as normal on the basis of the McQuaid-Ehn grain size test in order to have good creep and graphitization resistance. He described electrodes, welding sequence, and inspection of finished welds, and closed his talk by stating that the situation of fissuring and notch sensitivity in welds indicates a serious need for improved procedures and guidance for welding high-pressure, high-temperature piping.

Vincent T. Malcolm, Director of Research, Chapman Valve Manufacturing Co., Emphasizes a Point of Interest in His Talk at the Joint Meeting of the Washington Chapters of A.S.M. and A.W.S. (Photo by D. Ballard)

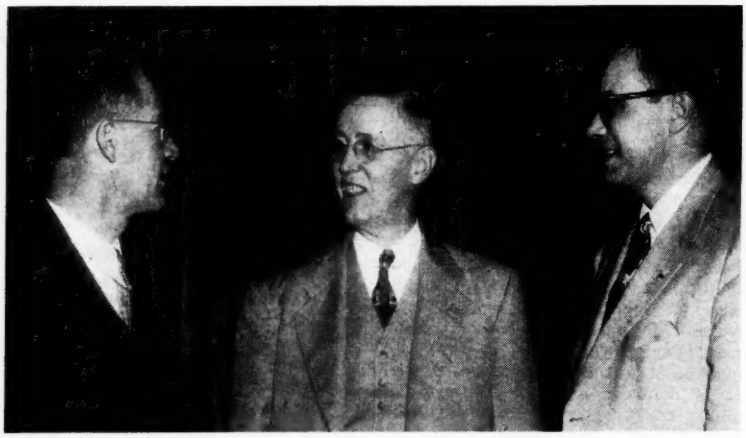
Nondestructive Testing Talk Given at Ft. Wayne

The Fort Wayne Chapter's January meeting featured Robert C. McMaster, supervisor of the electrical engineering division and the nondestructive test development laboratory at Battelle Memorial Institute. He presented a somewhat modified and condensed version of his 1952 Edgar Marburg Lecture on "Nondestructive Testing" (from the Fiftieth Anniversary Meeting of the American Society for Testing Materials in New York in June 1952).

In an interesting introduction he noted that everyone is continually making nondestructive tests through his senses. He noted that a billion dollar industry, coin-operated vending equipment, leans heavily on nondestructive tests. In these machines, various types of measuring, weighing, and testing devices operate quickly to turn back defective or illegal coins.

Millions of dollars are spent annually in the petroleum industry on periodic visual inspection of the surface, inside and out, of oil well tubing, which is fully justified in the prevention of failures in drilling operations where great time and expense would be involved in replacing material which failed far below the earth's surface.

High-Speed Flight Problems Discussed



John F. Victory (Center), Executive Secretary of the National Advisory Committee for Aeronautics, Presented a Talk on "Some Problems of Very High Speed Flight" at the January Meeting in Pittsburgh. With Mr. Victory are, left, P. T. Stroup, chief, process metallurgy division, Aluminum Research Laboratories, Aluminum Co. of America, technical chairman, and George M. Snyder, vice-president, Woodings-Verona Tool Works, Inc., chapter chairman

Reported by S. Rosecrans
Westinghouse Electric Corp.

The Pittsburgh Chapter heard John F. Victory, executive secretary of the National Avisory Committee for Aeronautics, speak on "Some Problems of Very High-Speed Flight" at its January meeting. Introducing his talk with humorous anecdotes about the founding of the N.A.C.A., the speaker proceeded to outline several of the major difficulties that have to be overcome in flying at speeds up to 2000 mph.

Dr. Victory pointed out that aerodynamic heating may be a more formidable obstacle than the "sonic barrier". At sea level and speeds of 1400 mph., the skin friction may raise aircraft surface temperatures to 475° F. Such temperatures lower the strength of some structural aluminum alloys used in aircraft as much as 40%, thus introducing serious mechanical problems. As a consequence, intensive research is being carried out on stainless steel and titanium alloys as future aircraft construction materials.

Aerodynamic heating imposes further demands in the form of refrigeration equipment to keep the pilot from roasting to death, and vulnerable electronic and control equipment from being baked. Other major projects being worked on by the 7600 N.A.C.A. employees include studies of severe flutter which tends to destroy the aircraft in flight, dependability of engine operation at high altitudes, and automatic controls to permit the pilot to cope with the rapid action necessary in combat. The electronic and electrical gear in a combat plane were described as being equivalent in complexity to the combined circuits of a city power system, a radio broadcasting station, a television station, and the fire control system of a battle ship.

Following the talk, Dr. Victory showed colored motion pictures on "High-Speed Flight Research" which illustrated the experimental planes used as flying laboratories to determine essential design data during supersonic flight. Shown in the film were the launching from a "mother" bomber of the Bell X-1, first airplane to break the sonic barrier, and the Douglas Skyrocket, which has attained publicized speeds of 1238 mph. and altitudes of 79,000 ft.

Weld Rod Coatings Topic Of York Joint Meeting

Reported by Ray Vines
Dentists' Supply Co.

Harry F. Reid, Jr., head of technical service, Welding Electrode Division of the McKay Co., discussed "Weld Rod Coatings" at the February joint meeting of the York Chapters A.S.M. and A.W.S.

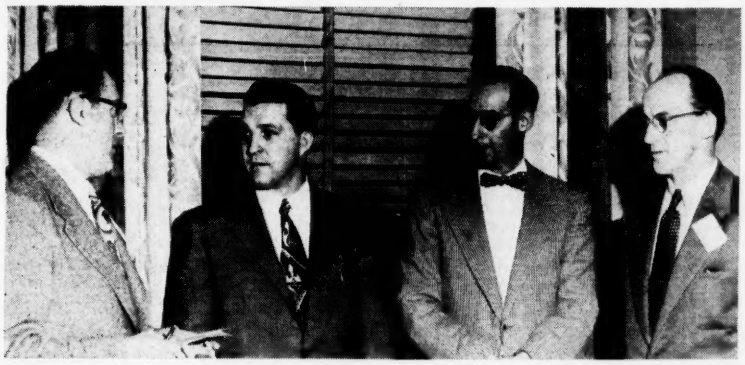
Mr. Reid listed the main functions of electrode coating materials as follows: *(1)* control of the electrical characteristics such as arc voltage, optimum amperage and suitability for DC or AC-DC use; *(2)* control of slag properties which influence the ease of slag removal, and suitability of the rod for position welding and for determining head contour; *(3)* control of metallurgical characteristics of the weld metal; and *(4)* to promote or permit extruding, drying and other necessary handling with high-speed equipment.

With these functions of the weld rod in mind, Mr. Reid classified major ingredients as arc stabilizers, fluxes and slag modifiers, deoxidizing and alloying agents, and binders and extrusion aids. Important arc stabilizers are titanium and potassium-bearing materials with lithium-content materials having some arc stabilizing properties. Calcium carbonate, fluorspar, silica, alumina, feldspar, manganese oxides, iron oxides, and wollastonite are the most popular fluxes and slag-forming materials.

The powders of the common alloying elements or their ferro alloys are used to develop the required metallurgical properties in the weld metal. By this means, weld metal strengths varying from 75,000 psi. to 122,000 psi. can be developed from a single base rod material. Binders and extrusion aids include liquid sodium or potassium silicate, clays, bentonites, starches, sugars, talc, mica and glycerine, plus selection and control of coating material grain size.

Mr. Reid also gave the composition of the coating for a number of typical mild steel and stainless electrodes in the A.W.S. classification. He described the development of cellulosic and lime-ferritic coatings, and gave an outline of the steps and necessary exacting control required in the manufacture of weld rod electrodes.

Predicts Rosy Iron Ore Outlook



At the February Meeting of the Milwaukee Chapter, D. I. Brown, Technical Editor of Iron Age, *Discussed "Our Iron Ore Outlook". Shown above are, from left: Cliff LaTour, E. F. Houghton and Co., technical chairman; Mr. Brown; Robert Ritzenthaler, curator of anthropology, Milwaukee Public Museum, who gave the coffee talk; and J. M. Beyerstedt, Nordberg Manufacturing Co., chapter chairman. (Photograph by M. A. Wallasz, Globe Tube Co.)*

Reported by William H. Myers
Macwhyte Co.

D. I. Brown, technical editor of *Iron Age* magazine, addressed the February meeting of the Milwaukee Chapter on "Our Iron Ore Outlook".

Mr. Brown stated that Milwaukee is the No. 5 industrial area of the nation, and is therefore very interested in the steel and ore outlook for the future. An old saying, "As steel goes, so goes the nation" is basically true, and Mr. Brown added, as iron ore goes, so goes steel. Due to exploration, development and finance, our iron ore outlook for the next 100 years is excellent. Because ore does not regenerate itself as does steel, we must find more and better ores continuously, and in the long pull we must utilize the low-grade ores, such as are found in Michigan, Minnesota, Wisconsin, Alabama, and Utah.

The ore picture is not one of competition, but one of various types of ore supplementing one another, enabling steel companies to meet demand for steel. The global strategy of ores which was started during World War II has produced a rosy picture for the future, with ore coming from Labrador, Venezuela and Africa.

Mr. Brown showed slides of 1950 ore production and the projected production of ore in 1960 due to increases in ore shipments from abroad and at home. Brazil has proven deposits of very rich 60—70% iron ore, hematite, of approximately 200 million tons. Venezuela, where Bethlehem and U. S. Steel have conducted extensive research and exploration, has proven resources of 500 million tons of 63% iron ore of a very good analysis for steel production.

The speaker discussed the Quebec-Labrador ore field which is being developed by the Iron Ore Co. of Canada. He told of his visit to this area where investigation has proven 150 million tons of 57—60% Fe ore are available. He also showed colored movies of the area which illustrated the country and conditions existing. Since 1945 all of the equipment needed for the development of this area, including buildings, bulldozers, and supplies, as well as personnel, has been flown in. The work in progress is conducted on a round-the-clock basis. Mining is performed 5½ months of the year during which time large quantities of the ore are stockpiled. Shipment of the ore to producing centers is operated on an eight month of the year schedule.

The speaker discussed methods of transporting Labrador ore to the United States steel producing centers. He advocated construction of the St. Lawrence seaway as the most advisable and stated that the seaway seems certain of being built, either by Canada alone or by joint action of Canada and U. S. If this method of transportation were available the Labrador ore could go in the Pittsburgh steel producing areas at a lower price than Mesabi ore which we are trying to conserve as a stockpile for future unknown demands.

Detroit Hears Talk on Controlled Atmosphere

Reported by D. N. Frey
Scientific Laboratory
Ford Motor Co.

Members at the January meeting of the Detroit Chapter heard Orville E. Cullen, chief metallurgist, Surface Combustion Co., speak on "Practical Applications of Controlled Atmospheres".

Mr. Cullen outlined the history of controlled atmospheres as well as the sources and chemistry of such atmospheres. He pointed out that the sources of controlled atmospheres are mainly hydrocarbon fuels, such as natural gas. Mr. Cullen covered the behavior of steel surfaces under oxidizing and reducing conditions, carburization of steels, oxidation of copper, and various types of controlled atmospheres used commercially.

Starting with the exothermic type of atmosphere, the simplest type can be considered fuel gas burned to high CO_2 content, which is usable under some conditions. However, cooling to reduce dew point affects greater utilization, and where the cost is warranted, a highly useful bright annealing gas can be obtained by scrubbing out the CO_2, thus producing the so-called commercial nitrogen. A modification of the above type of exothermic gas is formed by burning to an appreciable free-hydrogen content along with some CO and water, then removing the water and CO separately by oxidizing to CO_2 and scrubbing out, giving a 95% nitrogen, 5% hydrogen mixture. High-hydrogen-nitrogen-free endothermic gases can be formed by reacting methane or other higher hydrogen carbon gases with water vapor to give a special type of bright annealing gas. The speaker noted that by-product nitrogen from oxygen plants may be utilized for bright annealing, provided steps are taken to remove or convert the residual oxygen in such gases.

Mr. Cullen then took up the endothermic gases of the carburizing type which are formed by reacting hydrocarbon gases with oxygen to give high percentages of CO. Methods of utilizing endothermic gases in carburizing were outlined. The basis of the dew-point method of control of carburizing potential was explained. It was considered that dew point has a sensitive measure of the CO/CO_2 ratio as it affects carburization.

High nitrogen gases for annealing processes formed from ammonia cracking were mentioned as an example of a controlled atmosphere not formed from a hydrocarbon fuel gas.

In closing, Mr. Cullen described the types of equipment used in industry plants for forming the gases he had explained.

Wilson at Saginaw Valley

Reported by William C. Cole
AC Spark Plug Division

A lecture on "Present Trends in High-Temperature Steels" was presented by A.S.M. National President Ralph L. Wilson at the National Officer's Night meeting of the Saginaw Valley Chapter in February.

Mr. Wilson, director of metallurgy at Timken Roller Bearing Co., discussed the effects of conservation of alloying metals, the changing status of the super-alloys, and the evaluation of high-temperature strength of steel by creep and rupture tests.

CHAPTER MEETING CALENDAR

CHAPTER	DATE	PLACE	SPEAKER	SUBJECT
Baltimore	May 18	Engineers Club	G. Perkins	New Applications for Aluminum
Boston	May 1	Hotel Shelton	H. H. Uhlig	Corrosion
British Columbia	May	Stanley Park		Annual Meeting
Buffalo	May 14	Bethlehem Supervisor's Club		Annual Meeting
Calumet	May 12	Phil Smidts	K. L. Fetters	Steel—Tons and More Tons
Canton-Massillon	May 5	Mergus Restaurant	R. L. Wilson	National Officers Night
Cedar Rapids	May 12	Roosevelt Hotel		Annual Meeting
Chicago	May 18	Furniture Mart		Ladies Night
Cincinnati	May 14	Terrace Park Country Club		Election Meeting
Cleveland	May 11	Hollenden Hotel	L. P. Bowers	Precious Gems (Ladies Night)
Columbia Basin	May			Annual Spring Dance
Columbus	May 6	Broad St. Church	Jerome Strauss	Hot Extrusion of Metals
Dayton	May 13	Pappy's Kitchen Klub		Stag Smoker
Detroit	May 11	Rackham Building	E. J. Hergenroether	Metal Supply Outlook
Eastern New York	May 12	Circle Inn		Annual Meeting
Georgia	May 23	Atlantic Steel Co. Picnic Grounds	Charles Elliott	Annual Meeting and Barbecue
Hartford	May 8	Hotel Bond		Host—New England Regional Meeting
Indianapolis	May 18	McClarney's Restaurant	R. C. McMaster	Nondestructive Testing
Inland Empire	May			Pullman Meeting
Kansas City	May 16	Yacht Club		Annual Outing
Lehigh Valley	May 8			Annual Dinner Dance
Los Alamos	May 20		C. B. Carpenter	Metallurgy in Great Britain
Louisville	May 5	Korfhage's Tavern		Ladies Night
Mahoning Valley	May 12	Trumbull Nonferrous Smelting Co.		Plant Visit
Milwaukee	May 15	North Hills Country Club		Election Meeting
Minnesota	May 21	Covered Wagon	N. K. Koebel	Controlled Atmospheres
Montreal	May 4	Queen's Hotel		Ladies Night—Annual Meeting
New Haven	May 21	Hotel Elton, Waterbury	Lt. Col. Paul	The Future of Titanium
New Jersey	May 18	Essex House Hotel	John Chipman	Meeting the Country's Need for Metallurgists
New York	May 11	Schwartz's Restaurant	R. B. Mears	Corrosion of Metals
Northern Ontario	May		K. L. Fetters	
Northwestern Pennsylvania	May 21	Erie, G. E. Plant		Refrigerator Assembly Line
Notre Dame	May 13	Engineering Building	H. H. Hanink	Aircraft Gas Turbine Metallurgy
Ontario	May 1	Toronto		Stump the Experts Night
Ottawa Valley	May 12	Phys. Met. Res. Lab.	J. U. MacEwan	Refining of Lead
Penn State	May 8	Lion Inn	Burns George	McFarland Award Banquet—Toolsteel
Philadelphia	May 14	Engineers Club	B. Stoughton	Some New Alloy Steels and Their Properties
Pittsburgh	May 14	Roosevelt Hotel	J. W. Hood	Alcoa's Quality Control System
Purdue	May 19	Lincoln Lodge	James Day	Stock Brokerage Explained
Rhode Island	May 6	Eng. Soc. Bldg.	Symposium	Surface Treatment of Toolsteels
Rochester	May 11	Howard Johnson's		Annual Meeting
Rockford	May 27	Faust Hotel	Peter Payson	TTT-Curve, a Guide to the Heat Treatment of Steels
St. Louis	May 15	Stratford Hotel	H. B. Osborn	Induction Heating

Saginaw Valley	**May 19**	Frankenmuth	**L. Heard**	Story of Fire
Southern Tier	**May 11**	Cornell University		Annual Meeting
Springfield	**May 18**	Ivy House	**A. E. Focke**	Wear of Metals
Syracuse	**May 16**	Hinderwalder's Grove		Annual Clambake
Texas	**May 5**	Ben Milam Hotel	**I. S. Levinson**	Copper Base Alloys
Toledo	**May 14**	Maumee River Yacht Club	**W. C. Doutt**	Heat Treating
Tri-City	**May 5**	Rock Island Arsenal	**Roy Allen**	Selection and Application of Steel
Utah	**May**			Plant Visit
Warren	**May 14**	El Rio	**G. C. Shafer**	Jet Engine—Principles and Fabrication
Washington	**May 11**	Naylor's Restaurant	**J. B. Austin**	Magnification in Time
Western Ontario	**May 15**	Mario's Tavern, Windsor		Heat Treatment of Steels
West Michigan	**May 18**	Rowe Hotel	**J. B. Austin**	Magnification in Time
Wichita	**May 19**	K. C. Hall	**A. F. Schroeder**	Heat Treatment of Steel
Worcester	**May 8**			New England Regional Meeting

Cleveland Boys Presented ASM-NSTA Awards at School

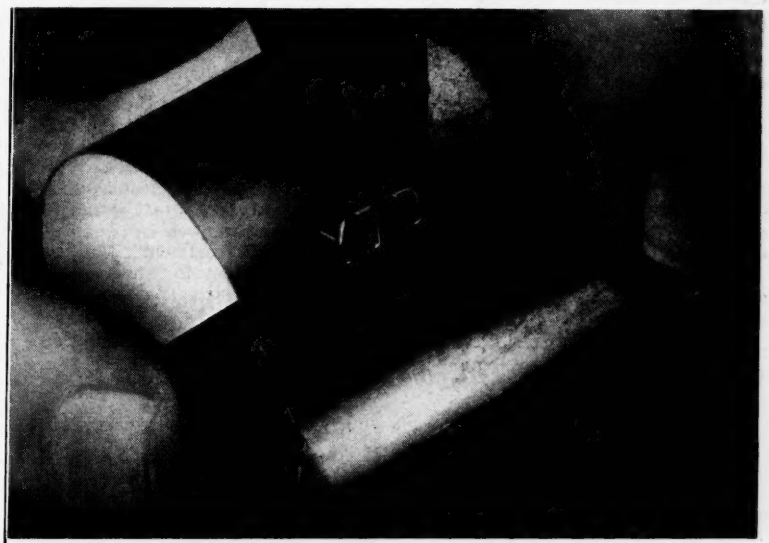
The enthusiasm expressed at the presentation of awards to student winners of the A.S.M.-N.S.T.A. Science Achievement Award Program is convincing evidence that the American Society for Metals has launched a very significant and worthwhile activity.

Two National Awards were recently made in the Cleveland area and both were attended by a representative of the Cleveland Chapter. The ceremonies, which were held during the morning chapel services of the schools, offered an opportunity for all of the students to witness the presentations to their classmates. This in turn should provide a great deal of stimulation and interest in students who have an inclination toward science study. More important, perhaps, is the encouragement given to the student winner himself.

The two winners were Sheridan Speeth, a 14-year old student from Wilbur Wright Junior High School, Cleveland, and William Bayer, a 13-year old student in the 8th grade at Hawken School, Lyndhurst.

This program of encouragement and stimulation for the youth in American junior and senior high schools has a very good chance of expanding into one of the most valuable and far-reaching activities yet launched by the American Society for Metals. There was evident at both presentations of awards to the young winners a demonstration of intense interest, both on the part of teaching staffs and student bodies. They seemed to feel that the program presented an open door for expression of talent, and an opportunity to make such talent count for something worthwhile.

Both Sheridan Speeth and William Bayer knew they had won national recognition. They knew too that more awards await completion of projects which can contribute to engineering progress and science.



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Like the bar in this picture, *every bar* of Ryerson alloy steel has its mark—a symbol that identifies the particular heat from which the bar was rolled. And on all but the smallest bars this heat symbol is unmistakably stamped into the steel itself.

The result: Positive heat identification, just one of eight ways that we protect you against the many slips that could occur before the alloy steel you order reaches you.

Your protection begins with careful selection of the heats to be carried in our stock. Next, analysis is verified and all Ryerson alloys are spark tested to guard against mixed steels. Then the bars are color marked and stamped to identify type and heat.

Meanwhile, we test a sample of every heat for hardenability and interpret the test results for you. So, finally, when you call Ryerson for alloys, you can be SURE—sure of the steel you get and sure of what it will do. Tested steel—racked separately by heats—is taken from stock; prepared to your specification; given a final inspection and shipped to you quickly. And with your steel (as-rolled or annealed), you receive complete test data to verify quality and guide your heat treatment.

This 8-point quality control is yours, at no extra cost, from Ryerson—and only from Ryerson. Just call your nearby Ryerson plant.

PRINCIPAL PRODUCTS IN STOCK: CARBON, ALLOY & STAINLESS STEEL—BARS, STRUCTURALS, PLATES, SHEETS, TUBING, ETC.

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Describes Meehanite Metals at Syracuse

Reported by W. C. Wheadon
Director, Institute of Industrial Research
Syracuse University

"Heat Treatment and Engineering Characteristics of Meehanite Metals" was the topic presented at the February meeting of the Syracuse Chapter by C. R. Austin, assistant to the president and director of research of Meehanite Metal Corp.

Dr. Austin first characterized Meehanite metals as castings having specific engineering and physical properties. Their manufacture is according to specifications allowing engineers to design as they would with steel. Meehanite metals derive their engineering qualities from the controlled dispersion and distribution of the uncombined carbon present throughout the matrix which is fully pearlitic.

The various operations of heat treatment applicable to Meehanite castings were discussed in detail. In explaining the various heat treatments employed, Dr. Austin explained graphically the behavior of the metals. Since the Meehanite matrix is essentially pearlite, the operations of austenitizing and quenching, tempering and annealing, produce, broadly speaking, the same microstructures as toolsteels would exhibit if subjected to the same treatment. The presence of excess uncombined carbon or graphite and other constituents of Meehanite prevent a complete analogy with toolsteels.

The effect of the various heat treatments on several Meehanite compositions was presented on slides. Values for tensile strength and hardness produced by various treatments, including isothermal processes, were compared in graphs and tables. Toughness under impact and resistance to notch effect were demonstrated as being remarkably high for ferrous castings.

Dr. Austin concluded his presentation by describing the broad range of engineering applications for Meehanite and exhibited several pictures of unique Meehanite parts in service.

Following an extended and spirited discussion on several phases of materials engineering and on the details and practical aspects of heat treatment procedures, the speaker distributed several copies of a bulletin which has just been released on "Principles of Heat Treatment". This is a companion booklet to what appears to be the first strip film and sound disk prepared on the subject matter.

Conduct Educational Course at Oak Ridge

Reported by G. M. Slaughter
Metallurgist
Oak Ridge National Laboratory

The 1953 educational program of the Oak Ridge Chapter began with a series of three informative and well-attended lectures on "The importance of Temperature Measurement in Welding Research" by Ernest F. Nippes, associate professor and supervisor of welding research and Warren F. Savage, assistant professor and supervisor of several resistance welding research programs, department of metallurgical engineering, Rensselaer Polytechnic Institute. A total of over 140 members and interested visitors attended the three meetings.

It has long been recognized that the thermal cycling resulting from welding operations has an important effect upon the properties of metals being welded. Various regions in the surrounding base metal are subjected to different thermal gradients; thus, for materials such as steels, there may be both grain growth and a change in crystal structure present. Cooling rate is often an important factor in determining physical properties in the weld heat-affected zone, since a 1500° F. temperature gradient in 0.2 in. is not uncommon in arc welding, and a cooling rate of 12,000° F. per sec. is common in spot welding.

The basis of the arc welding research at Rensselaer is that the principles of hardenability should be applicable to the determination of the arc weldability of steels. By the use of appropriately placed thermocouples in the heat affected zone, heating and cooling curves were determined at several distances from the weld center line under various sets of welding conditions. Jominy bars, machined from steel plate and heat treated so as to obtain an austenitic grain size and homogeneity similar to the most hardenable region of the heat affected zone, were used to find the fastest cooling rate which would avoid the formation of martensite. A mathematical relationship has been developed where a function of time and distance from the weld center-line can be used to determine the maximum temperature that a point reaches which is located at any distance from this weld center-line. The relationships found in these investigations can be used, for example, to determine the amount of preheat necessary to eliminate martensite in hardenable steels and for the selection of proper energy inputs resulting in the obtaining of desired cooling rates.

E. F. Nippes (Left) and W. F. Savage Recently Completed a Series of Three Educational Lectures on the "Importance of Temperature Measurement in Welding Research" at the Oak Ridge Chapter of the Society

Many attempts have been made to evaluate the mechanical properties of different structures found in weld heat affected zones. Conventional impact tests made on bars notched in the heat affected zones are often anomalous, since the fracture tended to propagate into other structures. It can be seen that ideally the whole central portion of the notched bar impact specimen should be the same throughout. The heating rate and cooling rate producing the structure to be tested should exactly match those producing the structure to be duplicated in the weld zone. Researchers at Rensselaer make use of a flash welder, as an easily controlled source of heat, and an elaborate and intricate electronic temperature measuring and controlling device to duplicate desired thermal cycles. An interesting phenomenon found in the course of a particular investigation was that areas heated to about 900° F. in the weld zone showed very low impact strengths and high values for the ductile-to-brittle transition temperature.

Flash welding is an important industrial process in today's mass production assembly lines. It provides joint efficiencies of nearly 100% for compatible sections since the molten metal formed during flashing is forced out of the joint during the upset portion of the cycle. The nature of the temperature distribution obtained during flashing has been measured and studied at Rensselaer for aluminum, low carbon steel, and molybdenum; and from these studies, the elimination or minimization of various undesirable metallographic structures can often be accomplished. Likewise, temperature measurements during the upset portion of the welding cycle often indicate the desired amount of upset required to force overheated material out of the welded joint.

Temperature measurement has also played an important role in spot welding research. Again thermocouples placed in the region adjacent to the zone to be welded were used to record heating and cooling curves. The successful spot welding of materials such as armor plate may require the use of a grain refinement treatment and then a subsequent temper before a structure can be obtained which is suitable for the required ballistic tests.

Thus it was demonstrated that the solution of many of the problems of the welding industry may be achieved by the employment of the relatively fundamental approach of temperature measurements in welding research.

Columbus Course Committee Members

The Educational Committee of the Columbus Chapter A.S.M. Includes the Following Members, From Left: M. C. Udy; J. T. Stacy; C. S. Thomas, Chairman; J. G. Kura, and J. Cubbs. The Chapter has just completed a series of five lectures on "The Practical Approach to Metal Problems"

Reported by J. T. Stacy
Battelle Memorial Institute

The Columbus Chapter has just completed a series of educational lectures on "The Practical Approach to Metal Problems". The lectures were held at Battelle Memorial Institute on Mar. 12, 16, 19, 24 and 26, and stressed the practical approach to metal problems with emphasis on field or service failures, their cause and prevention through proper design and selection of materials. The lectures and speakers were as follows:

"Design of Metallic Parts", by H. W. McQuaid, metallurgical consultant.

"Selection and Application of Toolsteels", by S. R. Prance, chief metallurgist, Inland Manufacturing Division, General Motors Corp.

"Fabrication and Heat Treatment of Metallic Parts", by John D. Graham, works metallurgist, International Harvester Co.

"Testing and Quality Control of Metallic Parts", by Samuel A. Wenk, supervisor of nondestructive testing, Battelle Memorial Institute.

"Over-All Problems of Design, Selection, Fabrication, Heat Treatment, Testing, and Quality Control of Metallic Materials and Parts", by F. T. McGuire, manager, materials engineering department, Deere and Co.

Metal Institute Meets

The 1953 Annual Spring Meeting of the Metal Treating Institute will be held in Houston, Texas, from May 18 through May 20.

Phoenix Meeting Features New Metals

Reported by W. B. Arness
Engineer
Goodyear Aircraft Corp.

The Phoenix Chapter held its January meeting at Arizona State College. Bruce A. Rogers of the Iowa State College Institute for Atomic Research and the Ames Laboratory of the Atomic Energy Commission spoke on "The New Metals".

Dr. Rogers described such metals as molybdenum, titanium, zirconium, vanadium, and hafnium, and displayed interesting samples of these metals and their alloys. He reported briefly on their properties and the reasons they are important to the fabricating industries, aviation, and the atomic energy field. Out of the research progress accomplished by the program centering around the new metals is emerging a substantial commercial production of new metals and alloys which hold great promise for broad industrial use to resist corrosion and heat, to provide exceptional strength and stiffness, and to meet the complex problems of controlling the release of atomic energy for the generation of useful power.

Mr. Arness, who is Chapter chairman, reported further on the Chapter's activities by stating that the response of the Chapter to this program was such that guests had to be turned away from the dinner meeting. Some had come from Ray, nearly 100 miles away, to attend the meeting. The implication of this experience is to emphasize the dearth in Phoenix and the surrounding area of firsthand, personal contact with the vanguards of technological progress. Society members in the area need and desire to come into contact with prominent scientists and industrialists who have carried out research on a large scale, and the Chapter officers feel that a situation exists which invites the attention of industrial and scientific institutions.

While Phoenix is often thought of as a winter and health resort, it is also the hub of industrial, mining, agricultural and cultural activities for an aggressive and fast-growing state. The combined industrial and mining business volume for the state is now ½ billion dollars annually, with 50,000 workers employed. The newly organized Phoenix Chapter stands in a position to supply the vital demand of this important segment of people for personal contact with metals technology, for adult education in this field, and for collaboration with schools. It is a task that presents a serious challenge to the resources of the Chapter and demands the utmost devotion from every officer and member.

THIRTY YEARS AGO

The October 1922 issue of the *Transactions* of the American Society for Steel Treating (which old-timers will remember as the original name of the American Society for Metals) contained a "Digest of Information on Duralumin", designated "a comparatively new arrival in the field of metallurgy". The author was HORACE C. KNERR, metallurgist, Naval Aircraft Factory, Philadelphia (now president of Metlab, Inc.).

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Metallurgical historians may be interested in the "Bibliography of High Speed Toolsteels" in the same issue, covering the years 1900 to 1922.

—30—

A news announcement states that G. B. WATERHOUSE, formerly with the Lackawanna Steel Co., had accepted an appointment as head of the department of metallurgy at Massachusetts Institute of Technology. Dr. Waterhouse, who served as A.S.M. national president in 1938, died May 10, 1952.

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Bound copies of Vol. 1 of the *Transactions* were advertised for sale at $10, the same price being charged today for back issues.

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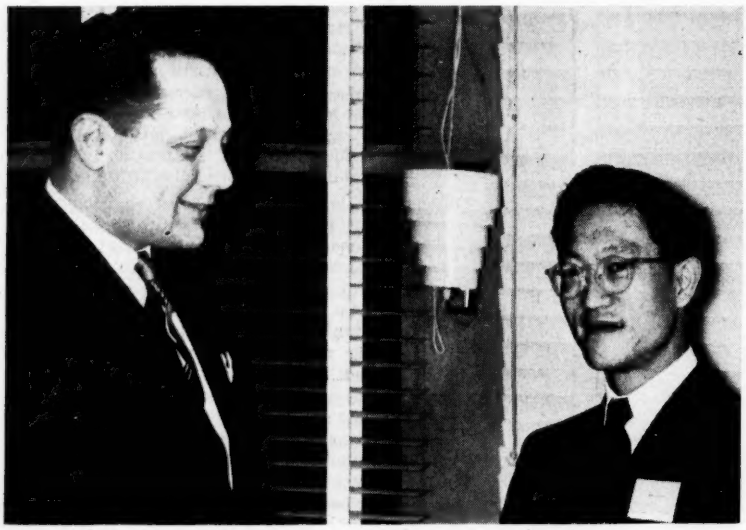
The first A.S.M. founder memberships were conferred in November 1922 upon WILLIAM P. WOODSIDE (now chairman of the board, Park Chemical Co.) and THEODORE E. BARKER†.

† Deceased.

Molybdenum Is Topic at Oak Ridge



Harry B. Goodwin (Left) of Battelle Memorial Institute Gave a Talk on "Recent Advances in the Metallurgy of Molybdenum" at the January Meeting of the Oak Ridge Chapter. Shown with Mr. Goodwin is Henry Inouye, Oak Ridge National Laboratory, who acted as chapter technical chairman

Reported by James L. Scott
Research Assistant
University of Tennessee

The January meeting of the Oak Ridge Chapter featured Harry B. Goodwin of Battelle Memorial Institute who spoke on "Advances in the Metallurgy of Molybdenum".

Mr. Goodwin discussed the unique properties and potential uses of molybdenum. Due to the high melting point of 4760° F., molybdenum has the ability to withstand a higher stress above 1600° F. than conventional high-temperature materials. It also exhibits a slower creep rate in the range of 1600 to 2000° F.

There are several problems connected with the use of pure molybdenum. It is very susceptible to high-temperature oxidation. The molybdenum oxide formed on the surface is very volatile and boils off leaving a new surface exposed. In research on the prevention of this rapid oxidation several methods have been tried. The metal may be clad with another metal such as nickel or treated to form a coat of molybdenum disilicide. Both methods are effective until a scratch or crack leaves molybdenum exposed. Then the coating becomes useless and rapid oxidation ensues. Another method tried was an attempt to find an alloy which would be resistant to oxidation. The best alloys found had about 100 times the resistance of pure molybdenum. This is still much too low.

Another serious problem with molybdenum is fabrication. In rolling (or otherwise working) molybdenum, the temperature is kept below the recrystallization temperature so that a "fibred" microstructure is produced and in this condition the metal possesses sufficient ductility for some uses. However, the ductility is insufficient for many potential uses. What is worse, after any treatment, such as welding, which recrystallizes the metal to form an equiaxed grain structure, present-day commercial molybdenum becomes extremely brittle. This is true of both arc-cast and powder metallurgy molybdenum.

On a laboratory scale it has been shown that very high-purity molybdenum is considerably more ductile than commercial molybdenum, even after welding or heat treatments which produce recrystallization. However, it is not believed feasible to produce such high-purity molybdenum on a commercial scale. Alloy additions such as titanium, which tie up the impurities causing embrittlement, also improve the ductility. These impurieies are primarily oxygen, carbon and nitrogen.

Mr. Goodwin discussed experimental use of molybdenum in jet engines operated on test stands. Metal-coated molybdenum blades have performed excellently for over 100 hr. of operation. In other supposedly similar blades failure occurred in only a few minutes. Unfortunately there is no way to predict failure. The main problem here is the development of a good nondestructive test for the integrity of the coating on coated molybdenum parts. Another problem in this application is that dust, pebbles, and birds sometimes pass through jet engines so coatings must be ductile enough to withstand such abuse.

Corrosion in Action Theme at Pittsburgh

Reported by R. J. Reitz
Metallurgist
Aluminum Co. of America

Frank L. LaQue, in charge of the corrosion engineering section of the International Nickel Co., introduced the movie, "Corrosion in Action", at Sustaining Members meeting of the Pittsburgh Chapter in February. This outstanding film was made under Mr. LaQue's supervision.

The movie portrays a short history of the contributions of such early subscribers to the electrochemical theory of corrosion as Sir Humphrey Davies and Michael Faraday. The cast includes, in order of their 'disappearance" from a practical viewpoint, the galvantic series of metals and alloys. The classic version is the electromotive series. These series are used to explain the basic reactivity of different metals.

One of many outstanding features of this movie is the method in which a reaction was first demonstrated and explained on laboratory scale and then illustrated in practical application. The role of oxygen in corrosion problems was amply displayed. The depolarization effect of oxygen at the cathode was illustrated by high-current flow while oxygen was bubbling through an electrolyte in a galvantic cell hook-up and by a steady drop in current to an equilibrium point when the oxygen was cut off. Corrosion by oxygen starvation was shown both in laboratory tests and actual conditions at Kure Beach test station. Spots on the same piece of metal, when deprived of oxygen in a corroding medium, showed severe localized corrosion in the shielded areas.

While the general theory of galvantic action is recognized by many people dealing with metals, some aspects of corrosion by contact between dissimilar metals shown in this movie are probably not as familiar. These include, for example, the fact that much more severe corrosion takes place when a relatively large cathodic area is present. This was illustrated by two sets of riveted plates which were immersed in sea water. These plates were made up of copper rivets in steel plates and steel rivets in copper plates. Failure occurred in the latter, while the former gave little evidence of attack.

In the latter part of the film the manner and operation of passivity was discussed and it was shown that it ranges from the light fragile type which might occur by passivation of ordinary iron with nitric acid, to the much more stable passivity shown by the alloys containing chromium and nickel.

A. S. M. Review of Current Metal Literature

An Annotated Survey of Engineering, Scientific and Industrial Journals and Books Here and Abroad Received During the Past Month

Prepared in the Library of Battelle Memorial Institute, Columbus, Ohio

Stewart J. Stockett, Technical Abstracter

Assisted by Claudia Carter, Ardeth Holmes, Norma King and Members of the Translation Group

A GENERAL METALLURGICAL

66-A. Metals in Review. *Engineering and Mining Journal,* v. 154, Feb. 1953, p. 72-99, 123.

Includes: "Gold", M. A. Kriz; "Silver", H. M. Bratter; "Copper", H. H. Wanders; "Lead", R. L. Ziegfeld; "Zinc", C. R. Ince; "Tin", W. P. Shea; "Magnesium", J. D. Hanawalt; "Aluminum", G. P. Lutjen; "Uranium", B. Meyers; "Minor Metals", C. W. Merrill; and "Ferro-Alloy Metals", N. B. Melcher. (A general)

67-A. Supply of Alloying Metals Still Acute. Copper Also Remains Critical. Henry H. Fowler. *Industrial Gas,* v. 31, Feb. 1953, p. 6-7.

Present status of availability of alloying metals. Graphs. (A4)

68-A. Europeans Refine Aluminum Scrap by Alloying. Hirsch Loevenstein. *Light Metal Age,* Feb. 1953, p. 18-20.

Shows that Zn can be used economically and with many advantages to refine Al scrap. Tables. (A8, Al, Zn)

69-A. Industry's Responsibility to Youth. John S. Bugas. *Transactions of the American Foundrymen's Society,* v. 60, 1952, p. 1-5.

Presents, in a general way, industry's part in American life. (A6)

70-A. Responsibility of Top Management in Training. J. D. Judge. *Transactions of the American Foundrymen's Society,* v. 60, 1952, p. 274-278.

Some reasons prompting initiation of a business; defines top management; organizational make-up of business; objectives and reason for training; and responsibilities of top management in training. (A6, A3)

71-A. Single Objective Safety. Dan Farrell. *Transactions of the American Foundrymen's Society,* v. 60, 1952, p. 282-286; disc., p. 286.

Situations in which accidents can and do occur in foundry. Possible solutions. (A7, E general)

72-A. Apprentice Training. It Is Needed. Maurice C. Sandes. *Transactions of the American Foundrymen's Society,* v. 60, 1952, p. 317-320; disc., 320-321.

Need for additional apprentice training in the foundry and obstacles to be overcome. (A3, E general)

73-A. Melt Department Incentive Plan. Erwin G. Tetzlaff. *Transactions of the American Foundrymen's Society,* v. 60, 1952, p. 432-435; disc., p. 435-438.

Statistical approach. Tables. (A6, E general)

74-A. The Foundryman Looks at Air Pollution. N. H. Keyser and H. P. Munger. *Transactions of the American Foundrymen's Society,* v. 60, 1952, p. 364-370; disc., p. 370.

Problem, source of contaminants, methods for control, and cost involved. 15 ref. (A7, E general)

75-A. How to Maintain Foundry Ventilation and Dust Collecting Systems. Kenneth M. Smith. *Transactions of the American Foundrymen's Society,* v. 60, 1952, p. 485-496.

A well-planned and operated preventive maintenance program for foundry ventilation and dust collecting equipment will permit full use of production equipment, and will provide cleaner and more comfortable working conditions in foundry. Diagrams. (A7, E general)

76-A. Applied Waste Control Principles. John R. Walley. *Transactions of the American Foundrymen's Society,* v. 60, 1952, p. 578-580; disc., p. 580.

General article which points out how to approach problems of waste and control. (A8)

77-A. Pricing Castings Using Standard Costs. Jeff A. Westover. *Transactions of the American Foundrymen's Society,* v. 60, 1952, p. 756-764; disc., 764-765.

Essentials of suitable pricing methods; figure build-up sheet, and overhead cost build-up sheet. (A4, E general)

78-A. (French.) Belgian Center for Study of Corrosion. Marcel Pourbaix. *Proceedings of the Third Meeting, Berne 1951,* International Committee of Electrochemical Thermodynamics and Kinetics, p. 198-203.

Activities of a research, technical, and educational institute. (A9, R11)

79-A. Outlook for Copper, Lead, and Zinc in 1953. William F. Boericke. *Analysts Journal,* v. 9, Feb. 1953, p. 21-23.

(A4, Cu, Pb, Zn)

80-A. Metal Conservation in Britain. *Metal Progress,* v. 63, Jan. 1953, p. 226, 228, 230. (Digest of "Report of the Metals Economy Advisory Committee" to the British Minstry of Supply, Sept. 11, 1952. H. M. Stationery Office, London, England.)

(A4)

81-A. Mineral Economics. J. D. Ridge. *Mineral Industries,* v. 22, Feb. 1953, p. 5-7.

Brief analysis of future prospects of Al and Cu. Graphs. (A4, Cu, Al)

82-A. International Cooperation in Metallurgical Literature Classification. Marjorie R. Hyslop. *American Documentation,* v. 4, Jan. 1953, p. 1-3.

Development of the ASM-SLA classification and problems encountered in its extension. (A10, U8)

The coding symbols at the end of the abstracts refer to the ASM-SLA Metallurgical Literature Classification. For details write to the American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio.

83-A. Application of Standard Business Machine Punched-Card Equipment to Metallurgical Literature References. Alvin T. Maierson and W. W. Howell. *American Documentation,* v. 4, Jan. 1953, p. 3-13.

Shows that an information service for metallurgy can be set up by using standard equipment and ASM-SLA coding system. (A9, U8)

84-A. Tin in the American Economy. Bruce W. Gonser. *Battelle Technical Review,* v. 2, Mar. 1953, p. 31-32.

Importance in our economy, Sn-plating developments, and uncertainty of supply. (A4, Sn)

85-A. Aluminum Industry Expands for War and Peace. Samuel W. Anderson. *Journal of Metals,* v. 5, Mar. 1953, p. 388-394.

Future prospects with respect to ores, available power, potential uses, substitutes, and stockpiling. Graphs and photographs. (A4, Al)

86-A. Automatic Zinc Sampler Saves Handling Time. Fred J. Meek. *Journal of Metals,* v. 5, Mar. 1953, p. 404.

Savings resulting from use of fork lift trucks and automatic sampler in handling metal from furnaces to railroad cars. (A5, Zn)

87-A. Aluminium Development in Relation to Supply. E. G. West. *Metallurgia,* v. 47, Feb. 1953, p. 63-69.

General discussion of the future trends in economic supplies. Photographs. (A4, Al)

88-A. Spontaneous Combustion of Metal Powders. Bernard Kopelman and Vera B. Compton. *Metal Progress,* v. 63, Feb. 1953, p. 77-79.

Characteristics of pyrophoricity, procedure for handling metal powders, and uses. (A7, H general)

89-A. Securing a Competitive Position by Sound Engineering and Modern Equipment. W. W. Sieg. *Metal Progress,* v. 63, Feb. 1953, p. 80-82.

Importance of metallurgy to the general public. Example from operations in brass mill. (A6, F23, Cu)

90-A. Control and Disposal of Swarf and Waste Metal. *Pera Bulletin,* v. 6, Feb. 1953, p. 67-71.

Methods for disposing of ferrous and nonferrous turnings. 25 ref. (A8)

91-A. (Book.) United Nations Quarterly Bulletin of Steel Statistics for Europe. No. 9, Dec. 1952, 115 pages. United Nations Sales and Circulation Department, Lake Success, N. Y.

Tabulated data on production of raw materials and finished steel. (A4, ST)

92-A. (Book.) The Wire Reference Year Book and Directory, 1952-53. Ed. 2. Alfred Hinde, Ltd., Clarence Street, Wolverhampton, England. 25s.

Introduces system of geographical coding enabling buyers to locate nearest suppliers of wire products and processes. Extensive wire bibliographies, articles on wire and furnaces, list of British standards, and tables. (A10, F28)

B

RAW MATERIALS AND ORE PREPARATION

48-B. Reserve Mining Company Building Large Plant to Process Taconite. Charles Longenecker. *Blast Furnace and Steel Plant,* v. 41, Feb. 1953, p. 189-191.

General discussion of plant design and equipment. Photographs. (B14, Fe)

49-B. Grinding and Crushing. *Chemical Engineering Progress,* v. 49, Feb. 1953, p. 55-72.

Includes "Fundamental Aspects of Grinding", Edgar L. Piret; "Types of Grinding Mills and When to Use Them", Henry W. Erickson; and "Unusual Techniques in Grinding", J. Howard Foote. (B13)

50-B. New Devices, New Flowsheets Liven Iron Ore Processing. Leslie J. Bechaud, Jr. *Engineering and Mining Journal,* v. 154, Feb. 1953, p. 124-127.

New developments in use of cyclones, HMS units, magnetic separators, spirals, and classifiers. (B14, Fe)

51-B. Humboldt Iron Will Be Recovered by Flotation. D. K. Campbell and L. J. Erck. *Engineering and Mining Journal,* v 154, Feb. 1953, p. 129-131.

Developments of an open-pit mine with a plant for beneficiating iron-bearing material by froth flotation. Diagrams. (B14, Fe)

52-B. New Processes Feature Gains in Nonferrous Metallurgy. A. W. Schlechten. *Engineering and Mining Journal,* v. 154, Feb. 1953, p. 132-134, 136.

Reviews work and previous literature on Sterling process, flash roasting, hot patching of furnaces and Fluosolids roasting. Photographs. (B15)

53-B. Titanium. John Loughlin, *Light Metal Age,* Feb. 1953, p. 16-17, 20, 30-31.

Deposits and research laboratories in Australia. Diagrams. (B-10, A9, Ti)

54-B. Big New Plants Highlight Beneficiation Development. E. H. Crabtree. *Mining Engineering,* v. 5, Feb. 1953, p. 156-161.

Plant construction, increased capacity in copper plants, hydrometallurgy, and Chemico process for nonferrous metals. (B14)

55-B. A Method for Concentration of North Carolina Spodumene Ores. Mason K. Banks, William T. McDaniel, and Philip N. Sales. *Mining Engineering,* v. 5, Feb. 1953, p. 181-186.

Process was developed which produces spodumene concentrates assaying 6.0% Li_2O and 0.45% Fe_2O_3, with 70-75% recovery of spodumene. Two flotation separations are required. Simultaneous removal of mica, feldspar, and quartz as a froth product using a cationic collector; and subsequent removal of Fe-bearing minerals as a froth product while spodumene is depressed as a tailing are required. Tables. 11 ref. (B14)

56-B. Fundamentals of Foundry Refractories. J. D. Custer and J. Spotts McDowell. *Transactions of the American Foundrymen's Society,* v. 60, 1952, p. 681-685; disc., p. 685-686.

Intermediate and low-duty fireclay brick, high-duty fireclay brick, superduty fireclay refractories, high alumina refractories, silica refractories, basic refractories, ganister-fireclay mixes, hydraulic setting castable refractories, and plastic fire brick. (B19, E10)

57-B. Cominco Development in Lead Sintering Technique. R. Bainbridge. *Canadian Mining and Metallurgical Bulletin,* v. 46, Feb. 1953, p. 61-66; *Transactions of the Canadian Institute of Mining and Metallurgy,* v. 56, 1953, p. 13-18.

Significant phases in development of "wet-mix" process. Its application in present operations and in design of new plant now under construction. Tables and graphs. (B16, Pb)

58-B. Milling Tungsten Ores at the Getchell Mine. Keith Kunze. *Mining Congress Journal,* v. 39, Jan. 1953, p. 31-33.

Shows that acid leach helps convert scheelite concentrate to acceptable product. (B14, W)

59-B. New Oxide Lead Unit for Darwin. J. B. Huttl. *Engineering and Mining Journal,* v. 154, Mar. 1953, p. 81-83.

Mining and milling pyritic Pb-Zn and oxidized Pb-Ag ores. (B12, B13, Pb, Zn, Ag)

60-B. New Ideas for Bagdad Copper. Ernest R. Dickie, George Green, Olaf Hondrum, and George Colville. *Engineering and Mining Journal,* v. 154, Mar. 1953, p. 88-93.

Mining techniques and ore treatment. (B12, B13, B14, Cu)

61-B. Reserve Mining Reveals Beneficiation Process. Darwyn I. Brown. *Iron Age,* v. 171, Mar. 12, 1953, p. 129-134.

Process for extracting iron from taconite ore. Photographs. (B14, Fe)

62-B. Secondary Enrichment in Bolivian Tungsten Deposits. N. N. Kohanowski. *Mines Magazine,* v. 43, Feb. 1953, p. 17-24, 51, 59.

Tungsten minerals are reviewed to bring out their lesser known peculiarities. Mutual relationships are discussed to show mechanism of secondary enrichment. Farallonite is described. Diagrams. (B10, W)

63-B. Electrical and Metallurgical Improvements at Kennecott's Utah Copper Division Mills. R. J. Corfield and A. G. Johnson. *Mining Engineering,* v. 5, Mar. 1953, p. 274-276.

Improvements in power distribution, flotation motors, and Mo recovery. Photographs. (B14, Mo)

64-B. (Pamphlet.) **Cyanidation by Percolation of Tailings Lying on Tailings Area 11 and Machinery Area 12 at Kundip, W. A.** Evan E. Hughes and C. H. Meharry. Commonwealth Scientific and Industrial Research Organization and Kalgoorlie School of Mines, Western Australia, Report 472, Sept. 17, 1951, 3 pages.

Laboratory study using Au and Cu ores. Tabulated data. (B14, Au, Cu)

C

NONFERROUS EXTRACTION AND REFINING

33-C. Zirconium High-Temperature Experiments. Problems in the Production of Zirconium Alloys. *Chemical Age,* v. 68, Feb. 7, 1953, p. 247-250.

Three methods for direct production of Zr alloys without using metallic Zr. (C general, Zr)

34-C. Production of High Purity Lead. Italian Trials of Sulphamate Method. *Chemical Age,* v. 68, Feb. 7, 1953, p. 251-252.

Use of an electrolytic process. (C23, Pb)

35-C. A Note on Some New Reactions for Refining Titanium. S. Ramamurthy. *Journal of Scientific & Industrial Research,* v. 11B, Dec. 1952, p. 545-546.

Suggests three new reactions for extraction of Ti. Graphs. 4 ref. (C general, Ti)

36-C. (German.) **Removal of Bismuth by Blowing Copper Matte in the Converter.** Otto Nielsen. *Zeitschrift für Erzbergbau und Metallhüttenwesen,* v. 6, Jan. 1953, p. 9-12.

Attempt was made to remove Bi by fire refining of Cu. Principles, procedure, and results of process. Tables. (C21, Bi, Cu)

37-C. (German.) **Isothermic Desilvering of Raw Lead.** K. H. Lange-Eichholz and H. Wasow. *Zeitschrift für Erzbergbau und Metallhüttenwesen,* v. 6, Jan. 1953, p. 20-23.

New process does desilvering in a single step at room temperature. Test results and advantages. Photographs. 4 ref. (C28, Pb)

38-C. Recovery of Copper From Smelter Slags. Brahm Prakash and C. V. Sundaram. *Journal of the Indian Institute of Science,* v. 35, sec. B, Jan. 1953, p. 17-27.

Investigates direct leaching of Cu with ammoniacal $(NH_4)_2CO_3$ and $Fe_2(SO_4)_3$ solutions; and extraction by sulfatizing roast. Tables. 16 ref. (C21, A8, Cu)

39-C. Magnesium Progress in Britain. C. J. P. Ball. *Light Metals,* v. 16, Feb. 1953, p. 56-60.

Production of Mg alloys at low cost and production of better alloys to meet requirements of aircraft industry. Graphs, photographs, and tables. (C general, Mg, Zr)

40-C. Separate Circuits for Antimony and Gold Ores in Consolidated Murchison Reduction Plant. *South African Mining and Engineering Journal,* v. 63, Part II, Jan. 24, 1953, p. 859-861, 863.

Flow plan of reduction plant; legend covering flow circuits; description of units installed; metallurgical treatment of ores; and water and power supplies. Photographs and diagrams. (C21, Sb, Au)

41-C. (German.) **Extraction of Cadmium in the Zinc Works at Magdeburg.** Walter Langner and August Göbel. *Zeitschrift für Erzbergbau und Metallhüttenwesen,* v. 5, Dec. 1952, p. 480-485.

Electrolytic process of preparing Cd metal of 99.95% purity. (C23, Zn, Cd)

42-C. Gas-Burning Radial Engines Offer Low Cost, Efficient Power Generation. R. W. Bayerlein. *Gas Age,* v. 111, Mar. 12, 1953, p. 46-50, 92-94.

Operating information based on 120 engines which were in service for an average of 20,000 hr. each. Combination of efficiency and low upkeep makes engines ideally suited to electrolytic reduction of Al or other heavy duty power plant service. Photographs. (C23, Al)

43-C. The Hot-Wire Process for Zirconium. Robert B. Holden and Bernard Kopelman. *Journal of the Electrochemical Society,* v. 100, Mar. 1953, p. 120-125.

Study made of thermal decomposition of $ZrCl_4$ molecules which are isolated from effects of interaction with other tetra-iodide molecules and with reaction products. (C4, Zr)

44-C. A New Electrochemical Process for Indium. J. R. Mills, B. G. Hunt, and G. H. Turner. *Journal of the Electrochemical Society,* v. 100, Mar. 1953, p. 136-140.

Refining process and properties and uses of In. (C23, Q general, In)

45-C. Tristage Crystallization Process for Utilizing Western Ferrophosphorus. Lloyd H. Banning, Wallace E. Anable, and R. T. C. Rasmussen. *Journal of Metals,* v. 5, Mar. 1953; *Transactions of American Institute of Min-*

ing and Metallurgical Engineers, v. 197, 1953, p. 423-430.

Results are presented of a completed laboratory project which developed a tristage crystallization and hydrolysis process for recovering V, Cr, and a valuable phosphorus product. Graphs and tables. (C28, V, Cr)

46-C. Indium. J. Lomas. *Mine & Quarry Engineering,* v. 19, Mar. 1953, p. 96-97.

Applications, recovery, and refining of In. (C general, T general, In)

47-C. (Book.) The Casting of Non-Ferrous Ingots. Leslie Aitchison and V. Kondic. 366 pages. Macdonald & Evans Ltd., 8, John Street, Bedford Row, London, W.C.1. 42s.

Theoretical background including elementary metallurgical approach to the preparation of liquid metal for casting; metallurgical aspects, comparing various metals and industrial alloys; and production aspects, dealing with actual preparation of ingots. (C5, EC-a)

D

FERROUS REDUCTION AND REFINING

81-D. Water Failures on Blast Furnaces. Harold Goldfein. *Blast Furnace and Steel Plant,* v. 41, Feb. 1953, p. 209-212.

Various causes and how to handle them. (D1)

82-D. A Revolution in Iron-Making? Oxygen Enrichment and the Blast Furnace. Max Davies. *Discovery,* v. 14, Feb. 1953, p. 61-63.

Principles of blast-furnace operations. Diagrams. (D1)

83-D. Design—A Limiting Factor in the Life of Open-Hearth Furnace Refractories. J. H. Chesters. *Refractories Journal,* v. 29, Jan. 1953, p. 2-9.

Discusses such design objectives as heat release rates, super-refractories, convection heating, flow pattern control, and heat losses in cooling water. Photographs. 14 ref. (D2)

84-D. Blast Furnace Charging. *Times Review of Industry,* v. 7, Feb. 1953, p. 24-25, 27.

System of electrically controlled conveyors. Photographs. (D1)

85-D. Geochemistry and Refractories. E. F. Osborn. *Industrial Heating,* v. 20, Feb. 1953, p. 330, 332, 334, 336, 338, 340. (Extracts.)

Describes and evaluates refractories for use in the steel industry. (D general, ST)

86-D. Ingot Heat Conservation. L. H. W. Savage and R. T. Fowler. *Journal of the Iron and Steel Institute,* v. 173, Feb. 1953, p. 119-128.

Method by which heat transfer from a steel ingot can be determined by using the mold as a calorimeter. Graphs show how results can be applied to reduce track and heating times of ingots. Graphs and tables. 11 ref. (D9, ST)

87-D. Flicker Control in Arc Furnace Power Supply. R. F. Lawrence and R. L. Tremaine. *Steel,* v. 132, Feb. 23, 1953, p. 102, 105, 108, 111; Mar. 2, 1953, p. 96, 98, 100, 102, 105-106, 108-109.

Methods for determining voltage flicker in electric furnace power system, and an interpretation of results in terms of established light flicker limits. Information which can be used to evaluate any reasonable combination of synchronous condenser and buffer reactor, and effect of furnace size for any system impedance. (D5)

88-D. Silicon Content of Blast Furnace Iron Lowered by Oxygen Injection in Ladle. P. S. Leroy. *Journal of Metals,* v. 5, Mar. 1953, p. 396-400.

Considers O_2 for C reduction, decarburizing vs. desiliconizing, desiliconizing at blast furnace runner, and O_2 injection in transfer ladles. Diagrams. 9 ref. (D1, Fe)

89-D. Rimming Steel Production Rate Studied by Multiple Correlation. W. W. Black and C. R. Taylor. *Journal of Metals,* v. 5, Mar. 1953, p. 401-403.

Study of factors affecting production rate in 70-ton electric furnaces. Graphs. (D5, ST)

90-D. The High Top-Pressure Blast Furnace. E. L. Pepper. *Metal Progress,* v. 63, Feb. 1953, p. 71-73.

Operation of blast furnace at elevated top-pressures offers easy and economical way to increase pig iron production. Flue dust rate and manufacturing cost of pig iron are decreased. (D1, CI)

91-D. Recent Improvements in Electric Steelmaking. S. W. Poole. *Metal Progress,* v. 63, Feb. 1953, p. 110-112, 196, 198, 200, 202.

Notes on fume control, gas-heated hot tops, rare-earth metals for deoxidizers, "auto-pouring" of ingots, and substitute sources of Cr for low-carbon stainless steels. Report of 10th Electric Furnace Steel Conference of AIME. (D5, ST)

E

FOUNDRY

100-E. Castings With a Pedigree. Carl R. Loper, James D. Claffey, and Frank L. Waldenmeyer. *American Foundryman,* v. 23, Feb. 1953, p. 36-38.

Production of Al precision castings with controlled composition and mechanical properties. Check list of tests and properties which follow each casting from foundry to installation. Operation revolves around first dielectric unit to handle resin-bonded cores on metal plates. Photographs. (E15, Al)

101-E. New Cupola Emission Control Equipment Gives Faster Melting, Cleaner Air. *American Foundryman,* v. 23, Feb. 1953, p. 41-43.

Advantages of installation in cupola with respect to air pollution control. Photographs and diagrams. (E10)

102-E. Washburn Cores Disinterred. Pros and Cons of Necked Down Risers. J. B. Caine. *American Foundryman,* v. 23, Feb. 1953, p. 51-54.

Development of necked-down risers and why they were not successful. Present advantages and disadvantages. Diagrams and photographs. 5 ref. (E22)

103-E. Redesigning for Malleable Iron Cuts Costs, Improves Product. *American Foundryman,* v. 23, Feb. 1953, p. 55-56.

Illustrates how malleable iron castings replaced fabricated parts and the advantages gained. Use of castings resulted in lower cost, reduced weight, improved appearance, uniformity, and better machinability. Photographs. (E11, CI)

104-E. Synthetically Bonded Molding Sand. Mary T. Zemantowsky. *American Foundryman,* v. 23, Feb. 1953, p. 57-61.

Experiments to determine relationships among sintering point, bentonite-water ratio, and other properties of sand mixtures. Room and high-temperature properties were considered. Graphs. 35 ref. (E18)

105-E. Advantages of Insulating an Electric Furnace Roof. Charles C. Spencer. *American Foundryman,* v. 23, Feb. 1953, p. 65-66.

Use of standard materials results in substantial savings in initial cost and uninterrupted service of furnace roofs. Photographs. (E10)

106-E. "Push-Button" Control of Metal Composition Envisaged. *Foundry Trade Journal,* v. 94, Jan. 29, 1953, p. 119-123.

Cupola-charging system; theory and practice; working results. Photographs and tables. (E10, CI)

107-E. Present Developments and Future Trends in the Cast Iron Industry. John McGrandle. *Foundry Trade Journal,* v. 94, Jan. 29, 1953, p. 125-129.

Forces governing present tendencies are discussed and an attempt is made to indicate how far these developments may affect iron-founding industry. 10 ref. (E general, CI)

108-E. Mould Reaction. R. W. Ruddle. *Foundry Trade Journal,* v. 94, Feb. 5, 1953, p. 145-152.

Occurrence of mold reaction may, in certain circumstances, lead to an improvement in soundness of casting. Photographs, diagrams, and graphs. 7 ref. (E25, EG-a)

109-E. Sand Burn-On in Steel Castings. *Foundry Trade Journal,* v. 94, Feb. 5, 1953, p. 157-158.

Penetration of steel into sand molds, and burn-on of sand on steel castings. (E19, CI)

110-E. Permanent Mold Process. Harold E. Bourassa. *Light Metal Age,* Feb. 1953, p. 11-13, 20.

Large production runs make relatively difficult technique practical. Photographs. (E12)

111-E. Role of the Research Foundry Unit. G. A. Lillieqvist. *Transactions of the American Foundrymen's Society,* v. 60, 1952, p. 6-15.

Developments in processes, use of welding electrodes, inspection, deoxidizers, desulfurizers, and shell molding. Tables, graphs, and micrographs. 7 ref. (E general, A9)

112-E. Risering Castings. A Progress Report For 1948-1951. J. B. Caine. *Transactions of the American Foundrymen's Society,* v. 60, 1952, p. 16-22.

Difficulties with use of closely spaced risers required to meet feeding distances. Methods to overcome these difficulties and to enable the foundry to produce castings free from dispersed shrinkage with minimum number of reasonably sized risers and an acceptable yield. Steel was used as the example. Diagrams. 12 ref. (E22, CI)

113-E. A Study of the A.F.S. Fineness Test. H. A. Stephens. *Transactions of the American Foundrymen's Society,* v. 60, 1952, p. 53-67; disc., p. 67.

Errors due to sampling and sieving are examined. Method is developed for calibrating unknown sieves using standard sands under standard conditions. A.F.S. fineness number, and a new distribution index. Tables and photographs. 16 ref. (E18)

114-E. Manufacture of Cast Edge Tools in Rotary Furnace Steel. Gordon Keech, A. T. Batty, and W. M. Dummett. *Transactions of the American Foundrymen's Society,* v. 60, 1952, p. 68-74.

Origin of process and detailed description of the various tools and their actual manufacturing procedure. Photographs and micrographs. (E10, TS)

115-E. Development of Steel Foundries in India. N. G. Chakrabarti. *Transactions of the American Foundrymen's Society,* v. 60, 1952, p. 84-89.

Melting units, raw materials, refractories, fluxes, carbon electrodes for electric furnaces, furnaces, pat-

ternmaking, sand handling, molding, core-making, casting, stripping, annealing, fettling, and inspection. (E general, CI)

116-E. New Process for Nodular Iron Production at Low Treatment Cost. Carlo Longaretti and Mario Noris. *Transactions of the American Foundrymen's Society,* v. 60, 1952, p. 101-107; disc., p. 107-108.

Nodulizing treatment with direct use of pure Mg or high Mg alloys. Drawbacks and advantages of process. Micrographs and photographs. (E25, CI)

117-E. Gases and Naturally Occurring (Congenital) Blowholes in Foundry Practice. Albert M. Portevin, *Transactions of the American Foundrymen's Society,* v. 60, 1952, p. 109-124.

Defines blowholes and describes states of gases in metals, origin of foundry blowholes, dissolved gases, supersaturation, agitation, nucleation, segregation at solidification, gas content in metals, gas in suspension, general character of blowholes, estimating naturally occurring blowholes, and influence of metal impurities. (E25)

118-E. A Study of the Principles of Gating as Applied to Sprue-Base Design. K. Grube, J. G. Kura, and J. H. Jackson. *Transactions of the American Foundrymen's Society,* v. 60, 1952, p. 125-136.

Emphasis was placed on investigation of design of sprue base and effect of various gating ratios on casting quality. Photographs, graphs, and tables. 4 ref. (E22)

119-E. Investigation of Properties of Steel Sands at Elevated Temperatures. R. G. Thorpe, A. E. Riccardo, P. L. Widener, and P. E. Kyle. *Transactions of the American Foundrymen's Society,* v. 60, 1952, p. 197-210.

Includes laboratory stress-strain and expansion studies of several synthetic steel sand mixtures at elevated temperatures. Summarizes test results on scabbing tendencies of sand mixtures. Graphs and photographs. (E18, CI)

120-E. Risering of Gray Iron Castings. W. A. Schmidt and H. F. Taylor. *Transactions of the American Foundrymen's Society,* v. 60, 1952, p. 211-217; disc., p. 217.

Investigation to determine extent of shrinkage in gray iron castings. Photographs and diagrams. (E22, CI)

121-E. Production of Heavy Gear Wheels in Spheroidal Graphite Cast Iron. Corrado Galletto. *Transactions of the American Foundrymen's Society,* v. 60, 1952, p. 223-228; disc., p. 228.

Characteristic Italian application of Mg-containing spheroidal graphite cast iron in the manufacture of heavy gears with cast teeth. Photographs. (E11, CI)

122-E. Refining and Elimination of Gases From Metals and Alloys. Henry Lepp, Florent Monneret, and Paul Rame. *Transactions of the American Foundrymen's Society,* v. 60, 1952, p. 229-233.

Theory of refining and degasification of metals through method of selective oxidation, and application of this process. How brass castings of high mechanical characteristics can be made from reconditioned scrap metal without use of ingots. Photographs. 7 ref. (E25, Cu)

123-E. Influence of the Nature of Oven Atmosphere on Drying of Molds and Baking of Foundry Cores. Georges Ulmer and Maurice DeCrop. *Transactions of the American Foundrymen's Society,* v. 60, 1952, p. 234-246; disc., p. 246.

Drying and baking of sand; comparative tests on core baking in confined atmosphere and in changing atmosphere; and study of drying molds in steam atmospheres. Tables and graphs. 8 ref. (E21)

124-E. Refractories for the Basic Cupola. H. M. Kraner. *Transactions of the American Foundrymen's Society,* v. 60, 1952, p. 262-264; disc., p. 264-265.

Potential solubility of slag, consumption of refractory lining, and ingredients in refractory mixtures. 22 ref. (E10)

125-E. Effect of Binders and Additives on the High Temperature Properties of Foundry Sands. R. E. Morey, C. G. Ackerlind, and W. S. Pellini. *Transactions of the American Foundrymen's Society,* v. 60, 1952, p. 266-273.

Investigation to establish hot ductility characteristics of various sands. Graphs. 5 ref. (E18)

126-E. A.F.S. Safety, Hygiene, and Air Pollution Program. James R. Allan. *Transactions of the American Foundrymen's Society,* v. 60, 1952, p. 279-281.

Past accomplishments and problems of the future for controlling foundry pollution. (E general, A7)

127-E. Actual Application of Motion Pictures in Foundry Motion and Timestudy. M. T. Sell. *Transactions of the American Foundrymen's Society,* 1952, v. 60, p. 308-311.

Advantages of making time and motion studies with film. (E general, A6)

128-E. Some Practical Applications of Permeable Metal Casting Plaster. R. F. Dalton. *Transactions of the American Foundrymen's Society,* v. 60, 1952, p. 351-355; disc., p. 355.

Permeability of plaster molds for nonferrous metal casting. Process describes entraining of air into a formulated plaster mix wherein permeability in the mold is created by connections between finely divided air cells. Making molds for typical Al castings by this process. Photographs. 5 ref. (E16, Al, EG-a)

129-E. Production Experiences With a Basic Cupola. Sam F. Carter. *Transactions of the American Foundrymen's Society,* v. 60, 1952, p. 344-350; disc., p. 350.

Refractory lining and patching; slag-hole and tap-hole refractories; effect of varying degrees of slag basicity; economic considerations; slag composition; operation; and control. Use for nodular and special irons. Tables. (E10, CI)

130-E. The Nature of Bonding in Clays and Sand-Clay Mixtures. L. M. Diran and H. F. Taylor. *Transactions of the American Foundrymen's Society,* v. 60, 1952, p. 356-363; disc., p. 363.

Re-emphasizes fact that sand-clay mixtures are relatively complex aggregates and that a basic interpretation of bonding action is needed before true improvement can be made in molding mixtures. Diagrams. 10 ref. (E18)

131-E. Internal Porosity in Gray Iron Castings. John C. Hamaker, Jr., William P. Wood, and Franklin B. Rote. *Transactions of the American Foundrymen's Society,* v. 60, 1952, p. 401-427; disc., p. 427-431.

Influence of P and alloys on internal shrinkage porosity in a 3.25% C (total), 2.25% Si gray iron was determined by precision density measurements on unfed 4-in. cube castings. Measurements of liquid, solidification, and solid contractions of synthetic phosphide eutectic compositions permitted calculation of theoretical 4-in. cube void volumes produced by phosphide contraction. Photographs, graphs, tables, and micrographs. 27 ref. (E25, CI)

132-E. Patternmaking to Compensate for Shrink Allowance. M. K. Young. *Transactions of the American Foundrymen's Society,* v. 60, 1952, p. 477-481.

Application of medium-high and high-expansion gypsum cements, their characteristics, and methods of handling are set forth to illustrate versatility of materials in patternmaking for shrink allowance. Diagrams. (E17)

133-E. Refractory Selection Applied to Batch Type Air Furnaces. C. O. Schopp and P. F. Ulmer. *Transactions of the American Foundrymen's Society,* v. 60, 1952, p. 497-500; disc., p. 500.

Steps necessary to select a suitable refractory for a given operation when precise methods are not applicable, due to lack of control of a major number of conditions affecting life of the refractory. Photographs. (E10)

134-E. Effect of Slag on Furnace Linings. L. B. Wyckoff. *Transactions of the American Foundrymen's Society,* v. 60, 1952, p. 525-528; disc., p. 528.

Deals primarily with chemical reactions of slag on furnace linings. Considers cupola slags and acid linings. Diagrams. (E10)

135-E. New Methods in Metal Patternmaking. H. J. Jacobson. *Transactions of the American Foundrymen's Society;* v. 60, 1952, p. 529-532.

Automatic chucking of castings, Al metal patterns, driers, and pin corebox. (E17, Al)

136-E. Influence of Specimen Tube Loading and Riddle Size on Molding Sand Test Results. D. I. Huizenga and K. E. Spray. *Transactions of the American Foundrymen's Society,* v. 60, 1952, p. 533-535; disc., 535.

Investigation of various methods of test tube loading and of riddling sands through various sized riddles to determine their influence upon molding sand test results. Tables. (E18)

137-E. Ventilation at Non-Ferrous Melting and Pouring Operations. Herbert J. Weber. *Transactions of the American Foundrymen's Society,* v. 60, 1952, p. 563-569.

Methods of exhausting typical nonferrous pouring and melting operations which were found effective and practical. Photographs. (E23, A7)

138-E. Olivine Application in the Foundry. Gilbert S. Schaller. *Transactions of the American Foundrymen's Society,* v. 60, 1952, p. 558-662; disc., p. 562.

Properties of olivine, grain size classification, and corollary applications. Tables and graphs. 11 ref. (E18)

139-E. Effect of Sulphur on Fluidity of Gray Cast Iron. Lew F. Porter and Philip C. Rosenthal. *Transactions of the American Foundrymen's Society,* v. 60, 1952, p. 611-616.

Series of preliminary experiments was made to develop a laboratory melting technique that would reveal effects of S. Showed that S is detrimental to fluidity only when combined with sufficient Mn to form sulfides high in Mn. Pouring temperature was an important variable in altering influence of S. Tables, graphs, and micrographs. 4 ref. (E25, CI)

140-E. A Simplified Analysis of Riser Treatments. C. M. Adams, Jr. and H. F. Taylor. *Transactions of the American Foundrymen's Society,* v. 60, 1952, p. 617-622; disc., p. 622-623.

Reflects trend of experimental work in progress, develops appreciation of how heat is lost or conserved in risers, and shows mechanism by which heat is lost as it varies with riser size and metal composition. Diagrams and graphs. (E22)

141-E. Melting in a High Speed Reverberatory Furnace. R. G. Carlson and W. B. Scott. *Transactions of the American Foundrymen's Society,* v. 60, 1952, p. 624-626; disc., p. 626.

Briefly describes and illustrates furnace. (E10)

142-E. Air Pollution and the Cupola. J. C. Radcliffe and W. F. Delhey. *Transactions of the American Foundrymen's Society,* v. 60, 1952, p. 714-717.

Methods of measuring pollution and means of elimination. 7 ref. (E10, A7)

143-E. Factors Affecting Fluidity of Cast Iron. Lew F. Porter and Philip C. Rosenthal. *Transactions of the American Foundrymen's Society,* v. 60, 1952, p. 725-735; disc., p. 735-739.

Influence of mold atmosphere, nonmetallic inclusions, fluidity test mold, fluidity variations with carbon and temperature, and effect of temperature on fluidity. Graphs. 9 ref. (E25, CI)

144-E. How Iron and Steel Melt in a Cupola. H. W. Lownie, Jr., D. E. Krause, and C. T. Greenidge. *Transactions of the American Foundrymen's Society,* v. 60, 1952, p. 766-773; disc., p. 773-774.

Experiments using pig iron, cast iron, and steel. Description of cupola, operation, removing charges from cupola stack, coke conditions in frozen charges, and metal condition in frozen charges. Micrographs and photographs. (E10, CI)

145-E. Time of Formation of Spherulites in Hypo- and Hyper-Eutectic Irons. Jack Keverian, Clyde M. Adams, and Howard F. Taylor. *Transactions of the American Foundrymen's Society,* v. 60, 1952, p. 849-852; disc., p. 852-853.

Specimens of hypo and hypereutectic irons, treated with Mg and post-inoculated with ferrosilicon to nodulize graphite, were quenched from various temperatures. Evidence presented indicates spherulitic graphite precipitates in melt above eutectic temperature for both hypo and hypereutectic alloys. (E25, CI)

146-E. (German.) **Report on the Drying of Cores. Part I.** A. Brust and F. Roll. *Giesserei,* v. 39, Dec. 25, 1952, p. 678-681.

Basic principles of drying oils used as binders for sand-mold cores. Tables and graphs. (E18)

147-E. (German.) **Suggestions for Testing Procedures in the Enameling Industry.** A. Dietzel and W. Stegmaier. *Berichte der Deutschen Keramischen Gesellschaft e.V. und des Vereins Deutscher Emailfachleute e.V.,* v. 29, Oct. 1952, p. 352-356.

Testing molding sand for castings to be enameled. 11 ref. (E18)

148-E. Trouble-Shooting Die Casting Problems. W. M. Halliday. *Foundry,* v. 81, Feb. 1953, p. 86-91, 262-263; Mar. 1953, p. 196-197, 309-310, 312-313, 315-316, 318-319, 320-324, 326.

Some common defects encountered in production of die castings, together with their probable causes and methods of correcting the difficulties. Part II: Symptoms, causes, and remedies for defects relating to surface finish and physical properties of castings. (E13)

149-E. Ford's Cleveland Foundry. *Foundry,* v. 81, Mar. 1953, p. 138-189.

A series of articles describing coremaking, molding, melting, cleaning, and ventilating. Extensive photographs. (E general, A5)

150-E. Casting Design in Relation to Production. J. H. Pearce and G. D. Whitehouse. *Foundry Trade Journal,* v. 94, Feb. 12, 1953, p. 179-185.

Cooperation between designer and foundryman and proper design for good foundry practice. Diagrams and photographs. (E general)

151-E. Dressings for Dies. W. M. Halliday. *Foundry Trade Journal,* v. 94, Feb. 12, 1953, p. 189-191.

Deals with built-up deposits of molten alloy on die cavity wall. Preventive measures which can be applied to dies. (E13)

152-E. Sand Reclamation at Lynchburg Foundry. Larson E. Wile. *Foundry Trade Journal,* v. 94, Feb. 19, 1953, p. 207-215.

Sand-reclamation unit which reduces cost of core mixtures, diminishes waste sand disposal, and minimizes delivery difficulties. Diagrams, photographs, and tables. (E18)

153-E. Small Zinc Die Castings. Louis H. Morin. *Machinery* (London), v. 82, Jan. 30, 1953, p. 209-216.

Describes wide variety of die castings now produced and illustrates "transfer finger" and "gripper" arrangements. (E13, Zn)

154-E. Die-Cast Components in Gestetner Duplicators. *Metal Industry,* v. 82, Feb. 6, 1953, p. 105-108.

Advantageous use of pressure die castings. (E13, T10, Zn, Al)

155-E. Die Caster Features Two-Stage Injection. *Steel,* v. 132, Feb. 23, 1953, p. 96.

New die forge casting machine employing "cold-chamber" method of injection, but introducing a new principle which provides for rapid fill while metal is molten. High final squeezing pressure prevents shrinkage voids and excessive porosity. (E13)

156-E. Practical Aspects of Olivine as a Molding Material. John Sissener and Bjorn Langum. *Transactions of the American Foundrymen's Society,* v. 60, 1952, p. 38-42; disc., p. 43.

Previously abstracted from *American Foundryman;* item 274-E, 1952. (E19, CI)

157-E. Reclaiming Used Molding Sand by Air Scrubbing. H. H. Fairfield, James McConachie, and H. F. Graham. *Transactions of the American Foundrymen's Society,* v. 60, 1952, p. 296-299; disc., p. 299.

Previously abstracted from *Canadian Metals;* item 427-E, 1952. (E18)

158-E. Practical Suggestions for the Building of Wood Patterns. W. H. Siebert. *Transactions of the American Foundrymen's Society,* v. 60, 1952, p. 548-550; disc., p. 551.

Previously abstracted from *American Foundryman;* item 272-E, 1952. (E17)

159-E. Solar Makes Stainless Alloy Castings in New Shell Molding Foundry. *Western Metals,* v. 11, Feb. 1953, p. 50-52.

Advantages of using shell molding process. Photographs. (E16, SS)

160-E. (French.) **Some Remarks on Risers, Especially Atmospheric Risers.** Jean Gélain. *Fonderie,* Nov. 1952, p. 3163-3182.

Theoretical and practical aspects such as shape and size of risers; their range of effectiveness; feeding; and special problems of gray castings. (E22, CI)

161-E. Evaluating Cast Design. Robert J. Franck. *Machine Design,* v. 25, Mar. 1953, p. 104-108.

Economical production and full utilization of inherent advantages of castings for critical components can be secured by systematic designing. Photographs. (E general)

162-E. Tire Molds. An Advanced Example of the Casting Art. *Metal Progress,* v. 63, Feb. 1953, p. 97-104.

Making tire patterns and molds. Diagrams and photographs. (E16, Al)

163-E. (French.) **Study of Microshrinkage in Aluminum Alloy Castings.** Marcel Bardot. *Fonderie,* v. 83, Dec. 1952, p. 3207-3226.

Detailed study. Micrographs, tables, and diagrams. 12 ref. (E25, Al)

164-E. (Book) **Transactions of the American Foundrymen's Society.** V. 60. 862 pages. 1952. American Foundrymen's Society, 616 S. Michigan Ave., Chicago 5, Ill.

Texts of 100 technical papers, majority of which were abstracted separately, including exchange papers from foreign foundrymen's associations; transcripts of discussions following each paper. (E general)

F

PRIMARY MECHANICAL WORKING

83-F. Electrical Equipment in Steel Plants. Parts I and II. A. F. Kenyon. *Blast Furnace and Steel Plant,* v. 41, Jan. 1953, p. 81-86; Feb. 1953, p. 192-197.

Recent development of improved control and regulating systems. Part 2: Several types of strip mills now in use. Photographs. (F23, ST)

84-F. Standards for Rough Chipping and Removing Welds. Dean Van Order. *Transactions of the American Foundrymen's Society,* v. 60, 1952, p. 718-722; disc., p. 723-724.

Incentive plan for adequate weld removal. (F21)

85-F. Development of Electroformed Copper-Steel Wire. A. N. Gray. *Wire and Wire Products,* v. 28, Feb. 1953, p. 166-168, 218-219.

Traces development and functioning of apparatus to produce a satisfactory Cu-coated steel wire used for telephone drop wire. Diagrams and photographs. (F28, L18, CN, Cu)

86-F. (French.) **Note on the Apparatus for Hot Rolling Steel T-Bars at Sharp Angles.** Louis Gascuel. *L'Ossature Métallique,* v. 17, Dec. 1952, p. 581-582.

Discusses apparatus with respect to diameter and temperature of the product rolled. Schematic drawing. (F23, ST)

87-F. Alloy Steels Processed in Special Furnaces at Crucible. Parts I and II. *Industrial Heating,* v. 20, Jan. 1953, p. 28-30, 32, 75-76, 78, 80, 82; Feb. 1953, p. 268-270, 275-276, 278, 280.

Deals primarily with various furnaces involved in production of sheet and strip at Midland Pa. plant of the Crucible Steel Co. of America. Specific use of each type of furnace. Part II: Annealing and pickling lines. Photographs and diagrams. (F21, J23, AY)

88-F. Drill Press Extrusion Cuts Costs of Thin-Wall Parts. W. N. Parker. *Iron Age,* v. 171, Mar. 5, 1953, p. 171-175.

Extrusion process for production of fragile, cylindrical parts looks like spinning but uses only a drill press and special mandrel and set of rollers. (F24)

89-F. Rolling of Thin Strip. M. D. Stone. *Iron and Steel Engineer,* v. 30, Feb. 1953, p. 61-73; disc., p. 73-74.

Reviews previous investigations and calculations. Presents method to provide rolling mill designers with an accurate and practical method of handling problem of thin strip rolling. Graphs and tables. 22 ref. (F23)

90-F. Automatic Control for Regenerative Soaking Pits. Griffin L. Isaacs. *Iron and Steel Engineer,* v. 30, Feb. 1953, p. 75-78; disc., p. 78-82.

Automatic control on the pits improves quality; reduces maintenance and scale loss; and increases production. Diagrams. (F1)

91-F. Developments in the Rolling of Broad Flange Beams. G. Barry Thomas. *Journal of the Iron and Steel Institute,* v. 173, Feb. 1953, p. 113-118.

Details of roll design; methods of working in cogging and finishing mills; and construction of vertical roll housings to produce beams with parallel flanges. Diagrams and photographs. (F23)

92-F. The Electronic Control of Wire Drawing Machines. *Machinery Lloyd* (Overseas Ed.), v. 25, Jan. 31, 1953, p. 94-95, 97.

Electronic voltage control applied to wiredrawing machines, thus elim-

inating use of contactors, relays, or switched resistors. (F28)

93-F. Centrifugally Cast Steel Tubing. What It Has to Offer. Where It Can Be Used. T. E. Rybka. *Materials & Methods*, v. 37, Feb. 1953, p. 104-107.

Compositions, sizes, properties, and applications. Tables and photographs. (F26, E14, CI)

94-F. Why the 250-lb. Copper Wirebar? *Metal Industry*, v. 82, Jan. 30, 1953, p. 83-85; Feb. 6, 1953, p. 101-102.

Suggests modifications in size and weight of rod and compares mill with others in rod rolling industry. 32 ref. (F27, Cu)

95-F. Small 2-High Reversing Mills Gain Favor. E. C. Peterson. *Steel*, v. 132, Mar. 9, 1953, p. 115, 118, 120, 123.

Advantages of small mill for rolling semifinished specialty steel products. Used for high alloy, stainless, and toolsteels. (F23, AY, SS, TS)

96-F. World's Largest Forging Press. Design and Analysis of a 50,000-Ton-Capacity Machine. F. T. Morrison and R. G. Sturm. *Mechanical Engineering*, v. 75, Mar. 1953, p. 191-193, 204.

Stress analysis of various parts to confirm adequacy of design. Photographs. (F22, Q25)

97-F. Continuous Press Forging System Uses Novel Furnaces. Arthur H. Allen. *Metal Progress*, v. 63, Feb. 1953, p. 90-93.

Procedure and equipment at Dodge Div., Chrysler Corp. Photographs. (F22, CN)

G

SECONDARY MECHANICAL WORKING

91-G. Stretch-Forming. Part I. Forming Large Double-Curvature Skin-panels. The Avro Longitudinal Machine. Richard Wood. *Aircraft Production*, v. 15, Feb. 1953, p. 40-47.

Machine construction, forming dies, and forming technique. Graphs and diagrams. (G9)

92-G. Cadillac Teams CO_2 With Silicon Carbides to Grind Carbide Tools Better. T. N. Chambers and John Kwolek. *American Machinist*, v. 97, Feb. 16, 1953, p. 172-175.

Merits of using CO_2 as a coolant. Photographs. (G21, G18, C-n)

93-G. How GE Works Titanium. V. L. Coughlin. *American Machinist*, v. 97, Feb. 16, 1953, p. 176-181.

Summary of ideas developed for turning, forging, grinding, drilling, tapping, milling, and broaching. Photographs and diagrams. (G17, Ti)

94-G. Machinability of Cast Steels. IV, V, and VI. *American Machinist*, v. 97, Feb. 16, 1953, p. 189, 191, 193.

Extensive tabulated information which includes machining-data applications, power requirements, and machinability index. (G17, CI)

95-G. Gases Are Good Cutting Coolants. G. Pahlitzsch. *American Machinist*, v. 97, Feb. 16, 1953, p. 196-197.

Experiments showing advantages and disadvantages of CO_2 and N_2. Graphs. (G22)

96-G. Grinding-Machine Exhaust Systems. *Foundry Trade Journal*, v. 94, Feb. 5, 1953, p. 153-154.

Improvements in dust suppression on stand or pedestal grinding machines as used in steel and other foundries. Photographs and diagrams. (G18)

97-G. Creative Metal Stampings. J. D. M. White. *Modern Industrial Press*, v. 15, Feb. 1953, p. 13-14, 16, 20, 22, 26, 54.

Pictorial presentation. (G3)

98-G. Cylindrical Shells. An Experimental Investigation Into Redrawing. S. Y. Chung and H. W. Swift. *Iron & Steel*, v. 26, Feb. 1953, p. 63-66.

Experimental apparatus and procedure. Effects of first-stage drawing rates, inter-stage heat treatment, punch profile radius, first-stage radial clearance, redrawing ratio, material, temper, and blank thickness. Low-carbon rimming steel, 70-30 brass, and 99.0% Al were used. (G4, CN, Cu, Al)

99-G. Fabricating Stainless Steel Cooling and Holding Tanks. Howard E. Jackson. *Modern Industrial Press*, v. 15, Feb. 1953, p. 38, 42, 44, 46.

Fabrication of two basic types of cooling and holding bulk milk tanks from stainless steel. (G4, T29, SS)

100-G. Shot Peening to Reduce Porosity in Die Castings. Eugene F. Anderson. *Modern Metals*, v. 9, Feb. 1953, p. 46.

Use of shot-peening to eliminate porosity in castings which are subjected to pneumatic or hydraulic pressure. Photographs. (G23, E25, Al)

101-G. Shot Peening Coverage. (Extracts.) H. H. Miller and P. H. Flynn. *SAE Journal*, v. 61, Feb. 1953, p. 29-33.

Use of Straub and surface replica methods to provide accurately measured and easily controlled shot-peening coverage. Micrographs. (G23)

102-G. (German.) Development and Modern State of Cleaning of Steel Parts by Oxygen-Flame Torch. K. W. Sippell. *Schweissen und Schneiden*, v. 4, Nov. 1952, p. 381-393.

By flame cleaning, surface is loosened, reduced, or burned and can be removed easily by brushing. Apparatus, procedure, and examples. Photographs. 13 ref. (G22, CN)

103-G. Black-Bolt Heading Plant With Induction Heating. *Engineering*, v. 175, Feb. 13, 1953, p. 193-194.

How bolt-heading shop with high-frequency electric induction heating improves working conditions and gives closer control over heading process. Photographs. (G10)

104-G. Short Runs at Low Cost With Plastic Tooling. Walter G. Patton. *Iron Age*, v. 171, Feb. 19, 1953, p. 115-118.

Advantages of cast plastic stamping, forming, and drawing dies. Cost and production factors for automotive use are compared with metal dies. Tables. (G3, G4)

105-G. Hot Spinning Improves Workability of Titanium. Arnold S. Rose. *Iron Age*, v. 171, Feb. 19, 1953, p. 119-121.

Emphasizes need for localized heating of Ti to 1300° F. prior to spinning. (G13, Ti)

106-G. Small Parts Hot Headed in Cold-Heading Machines. H. Chase. *Iron Age*, v. 171, Feb. 19, 1953, p. 124-127.

A cold heading department which produces 1300 different parts on 125 cold headers and 26 boltmakers. Production of push rods is 31 per min. in a cold heading machine adapted for hot heading. Valve tappets of SAE 5120 cold drawn steel are made at the rate of 3000 per hr. (G10, AY)

107-G. How to Tap, Mill, and Broach Titanium. V. L. Coughlin. *Iron Age*, v. 171, Mar. 5, 1953, p. 186-188.

Control of property variations to obtain high strength, ductile, and machinable alloy material. Diagrams and photographs. (G17, Ti)

108-G. Evaluation of Drawing Lubricants. W. J. Wojtowicz. *Lubrication Engineering*, v. 9, Feb. 1953, p. 19-21, 41.

Discusses both oil and emulsion-type drawing compounds. Method of making preliminary assessments of these compounds, investigating lubricant variables, and providing information for intelligent formulation of new lubricants. (G21)

109-G. Powder-Cutting Eases Fabrication of Alloy Sheets for Minesweepers. Fred M. Burt. *Western Metals*, v. 11, Feb. 1953, p. 69-71.

Powder-cutting technique, which utilizes injection of a finely divided ferrous powder into cutting O_2 stream. Reaction between ferrous powder and O_2 generates an intense supplemental heat which melts refractory oxides as fast as they are formed. Manual arc welding is used for tack and finish welding of nonferrous special alloy parts. Photographs. (G22, K1, EG-a)

110-G. Stretch-Forming. Part II. Avro Practice in the Manipulation of Rolled and Extruded Section. Rotary Preforming-Machine. Richard Wood. *Aircraft Production*, v. 15, Mar. 1953, p. 82-89.

Prototype stretch-forming equipment built by Avro in 1937. Examples illustrate application of the technique to production of complex parts. Diagrams. (G9)

111-G. Complex Tube Bending. Peter Bell. *Canadian Metals*, v. 16, Feb. 1953, p. 44, 46.

Forming, inspection, and materials including Al, stainless steel, Cu, steel, and Ni alloy. (G6, Al, SS, Cu, ST, Ni)

112-G. Some Aspects of Metal Removal. Gerald P. Grote. *Engineering Experiment Station News* (Ohio State University), v. 25, Feb. 1953, p. 3-8, 40-42.

Methods of chipping, grinding, oxidation, and melting for steel, gray iron, and nodular iron. Tables, graphs, and micrographs. (G18, F21, ST, CI)

113-G. The Cutting of Metals With Sintered Alumina Tools. P. P. Groodov and M. P. Tzyganova. *Engineers' Digest*, v. 14, Feb. 1953, p. 59-61. (Translated and condensed from *Stanki i Instrument*, no. 4, 1952, p. 10-12.)

Results of tests on Al_2O_3-base nonmetallic cutting tool tips. Shows that small cross section of cut, absence of impact loads, and suitable tool designs are essential. Graphs and diagrams. (G17, T6, Al)

114-G. The Employment of Ceramic Materials for Cutting Metals. A. I. Isayev, N. N. Zorev, and L. K. Kootshma. *Engineers' Digest*, v. 14, Feb. 1953, p. 61-62. (Translated and condensed from *Stanki i Instrument*, no. 4, 1952, p. 12-14.)

Design of tools with detachable ceramic tips and replacement of carbide tips with ceramic ones under favorable circumstances. Graphs and diagrams. (G17, T6)

115-G. Machining. Theory and Practice. K. G. Lewis and W. Milne. *Machinery* (London), v. 82, Feb. 20, 1953, p. 353-360, 367.

Cutting fluid theory; factors influencing cooling requirements; effects of machining conditions, cold work and grinding on surface finish. Graphs and diagrams. (G17)

116-G. Precision Tube Bending. Gilbert C. Close. *Modern Machine Shop*, v. 25, Mar. 1953, p. 153-159.

Equipment and techniques employed in tangent bending of aircraft tubing. Photographs. (G6)

117-G. Thread and Form Rolling. Part 1. Types of Machines, Recommended Applications. C. T. Appleton. *Screw Machine Engineering*, v. 14, Mar. 1953, p. 31-35.

Reciprocating, rotary planetary, and cylindrical-die machines. Economy, thread rolling on screw machines, rates of production, and penetration rates. Tables and diagrams. (G12)

118-G. Speeds and Feeds for Drilling Steel. *Screw Machine Engineering,* v. 14, Mar. 1953, p. 53-54.

Data sheet based on use of high speed steel tools and an average 8-hr. tool life for parts made from cold drawn steel. (G17, CN, TS)

119-G. On Proper Tool Grinding for Machining Stainless Steels at Lower Costs With Higher Production. *Screw Machine Engineering,* v. 24, Mar. 1953 p. 55-56.

Data sheet showing that correctly ground tools lower unit cost. Describes grinding wheels for sharpening tools. (G18, SS)

120-G. (Book.) The Craft of the Metal Worker. R. S. Duddle. 160 pages. Anglobooks, 475 5th Ave., New York 17, N. Y. $4.00.

Contains a simple explanation, with adequate drawings, of many metalworking procedures. Some historical background. Does not cover machinery or machine operations. (G general)

H

POWDER METALLURGY

20-H. How Powder Metal Is Made. Samuel Bradbury. *Industrial Heating,* v. 20, Feb. 1953, p. 252, 254.

Atomizing of Pb, Sn, Al, and brass; chemical reduction of Cu, Fe, and W; and electrolytic deposition of Fe, Cu, and Ag. (H10, Pb, Sn, Al, Cu, Fe, W, Ag)

21-H. Powder Metallurgy in Metallurgical Research. W. R. Pitkin and D. J. Jones. *Journal of the Institute of Metals,* v. 81, Feb. 1953, p. 157-161.

Method for studying properties of certain metals and alloys. Tungsten for lamp filaments, alloys for tube filaments, and alloys having specific properties. Micrographs. (H general, W, Ni, Cu)

22-H. The Measurement of the Relative Hardnesses of Fine Powder Particles. J. B. Matthews. *Journal of the Institute of Metals,* v. 81, Feb. 1953, p. 279-285.

Method depends on decrease in specular reflectivity produced by bombarding the reflecting surface with powder particles. Data for Al powders are tabulated. (H11, Al)

23-H. Zirconium Now Fabricated by Powder Metallurgy Methods. Herbert S. Kalish. *Materials & Methods,* v. 37, Feb. 1953, p. 101-103.

Shows that sintered Zr is readily cold worked, reduces machining costs, minimizes scrap loss, and simplifies alloying. Micrographs and graphs. (H general, Zr)

24-H. Modern Techniques Produce Shell Cores. *Steel,* v. 132, Feb. 23, 1953, p. 92, 94.

Powder metallurgy techniques used in producing 4-lb. cores for 76-mm., and 8-lb. cores for 90-mm. shells. (H14, C-n)

25-H. Measurement of Particle Sizes in Opaque Bodies. R. L. Fullman. *Journal of Metals,* v. 5, Mar. 1953; *Transactions of American Institute of Mining and Metallurgical Engineers,* v. 197. 1953. p. 447-452.

Methods developed for analysis of particle sizes when particles are in form of spheres, plates, or rods. Diagrams. 11 ref. (H11)

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J

HEAT TREATMENT

59-J. Development, Principles, and Applications of Interrupted Quench Hardening. Richard F. Harvey. *Journal of the Franklin Institute,* v. 255, Feb. 1953, p. 93-99.

General discussion of quench hardening steel. 10 ref. (J26, ST)

60-J. Salt Versus Atmosphere Annealing. E. S. Tyler. *Wire and Wire Products,* v. 28, Feb. 1953, p. 156-157, 219-222.

Merits and weaknesses of batch-type salt bath and retort or bell-type atmosphere annealing. (J2)

61-J. Flame Hardening Using Oxy-Town Gas. *Machinery Lloyd* (Overseas Ed.), v. 25, Jan. 31, 1953, p. 103-105.

Advantages. (J2, CN)

62-J. How Cold Treatments Improve Performance of Materials. John L. Everhart. *Materials & Methods,* v. 37, Feb. 1953, p. 115-118.

How refrigeration is used to stabilize steel; to form shrink fits; to prevent aging of Al; and during machining and grinding. Photographs. (J2, G17, ST, Al)

63-J. (English.) High Frequency Hardening of Steel. *Aciers Fins et Spéciaux Francais,* Dec. 1952, p. 46-50.

Principles of process, types of heating units, design of heating coils, and suitability of various steels for this treatment. (J2, CN, AY)

64-J. Short Cycle for Hardening High-C, High-Cr Toolsteel. J. Y. Riedel. *Metal Progress,* v. 63, Feb. 1953, p. 67-70.

Practical short-time cycle in which austenitization is accomplished by heating at a relatively high temperature. (J26, TS)

65-J. Natural Gas and Propane-Air Gas in the Heat Treating Industry. Paul E. Peacock, Jr. *Metal Treating,* v. 4, Jan.-Feb. 1953, p. 2-3, 25.

Advantages and equipment. Diagrams and photographs. (J2)

66-J. Sub-Zero Treatment of Metals for Stabilization. R. S. Jamison. *Metal Treating,* v. 4, Jan.-Feb. 1953, p. 4-5.

Advantages of process which can be applied to various carbon and alloy steels as well as to cast iron stainless steel, and Al. (J2, CN, AY, SS, CI, Al)

67-J. Heat Treatment of Ductile Cast Iron. K. D. Millis. *Metal Treating,* v. 4, Jan.-Feb. 1953, p. 6-8.

Annealing and quench treatments. Micrographs. (J23, J26, CI)

68-J. New Continuous Heat-Treatment Installations at Vauxhall Motors Ltd., Luton. C. F. Milward. *Metal Treatment and Drop Forging,* v. 20, Feb. 1953, p. 51-55.

Survey is made of new installations for diverse heat treatment processes for steel forgings. Includes normalizing, pack carburizing, and cyanide hardening. Photographs. (J24, J26, J28, ST)

69-J. Salt v. Lead Patenting of Steel Wire. J. G. Wistreich. *Metal Treatment and Drop Forging,* v 20, Feb. 1953, p. 69-70.

Reviews investigation to determine whether salt and lead patented high-tensile wires are of comparable quality. (J25, ST)

70-J. Nitriding as a Production Tool. Lester F. Spencer. *Modern Machine Shop,* v. 25, Feb. 1953, p. 146-148, 150, 152, 154, 156, 158, 160; Mar. 1953, p. 160-168, 170.

The nitriding process and materials on which it may be used. Part 2: Equipment and recommended methods for processing work. Graphs, tables, and photographs. 12 ref. (J28, AY)

K

JOINING

173-K. Automatic Welding of Aluminum Pistons. *Railway Locomotives and Cars,* v. 127, Feb. 1953, p. 76-77.

Use of Aircomatic welding process for reclaiming Al diesel locomotive engine pistons. (K1, Al)

174-K. The Presidential Address. Robert Jenkins. *Transactions of the Institute of Welding,* v. 15, Dec. 1952, p. 151-160.

Discusses problems of residual stresses and distortion in electric arc welding. Photographs, diagrams, and graphs. (K1)

175-K. A.C. Argonarc Welding at Less Than 50 V r.m.s. Open Circuit. J. C. Needham and L. H. Orton. *Transactions of the Institute of Welding,* v. 15, Dec. 1952, p. 161-165.

Development of electronic unit permits major reduction in open circuit voltage. Diagrams. (K1)

176-K. Developments in Contact Arc Welding. D. Young and F. Zeller. *Welding and Metal Fabrication,* v. 21, Jan. 1953, p. 25-29; Feb. 1953, p. 51-54.

Contact "C18" electrode, vertical fillet welds, vertical lap welds, vertical prepared vee butt joints, horizontal vertical welding, inclined welding, and downhand welding. Graphs, tables, and diagrams. (K1, CN)

177-K. (German.) Advances in the Field of Welding and Cutting. K. L. Zeyen. *Schweissen und Schneiden,* v. 4, Nov. 1952, p. 402-416.

A survey of recent literature on the metallurgy of welding ferrous metals. 267 ref. (K general, ST)

178-K. (German.) Welding Under Stress Loading. H. Melhardt. *Schweisstechnik,* v. 6, Dec. 1952, p. 133-141.

Method for strengthening and repairing old bridges by welding. Photographs, diagrams, and graphs. (K general, T26)

179-K. (German.) Cold Welding of Metals. Jürgen Ruge. *Umschau in Wissenschaft und Technik,* v. 53, Jan. 1953, p. 12-13.

Reviews experiences in cold welding and equipment used. Photographs. 7 ref. (K5)

180-K. (German.) Economics of Welded Structures. Hans Manzinger. *Zeitschrift für Schweisstechnik; Journal de la Soudure,* v. 43, Jan. 1953, p. 5-14.

An evaluative survey of welding applications. Diagrams and photographs. (K general)

181-K. Report of Special Committee on Continuous Welded Rail. H. B. Christianson, chairman. *American Railway Engineering Association Bulletin,* v. 54, Feb. 1953, p. 1161-1173.

Includes "Fabrication. Encompassing Methods of Welding, Space and Facilities Required, Organization, Procedure, and Costs." F. W. Creedle, chairman; "Laying. Encompassing Track Preparations, Transportation and Distribution of Long Rails, Installation in Track, Temperature Considerations, Closure Welds, Disposition of Rail When Continuous Rail is Replaced, Length Limitations, Procedure at Insulated Joints, Switches, Railroad Crossings and Drawbridges, and Cost Data", F. G. Campbell, chairman; "Fastenings. Encompassing Rail Expansion, Types and Number of Anti-Creeping Devices on Welded Track and Adjacent Jointed Track, Type of Joint Bar at Ends of Welded Sections, Tie Plate and Spike Requirements, and Cost Data", J. W. Hopkins, chairman; "Maintenance. En-

compassing Maintenance of Rail, Track, Fastenings, Ties, and Ballast, Including Out-Of-Face Resurfacing and Reballasting, and Cost Data", C. E. Weller, chairman and "Economics of Continuous Welded Rail Versus Jointed Track", I. H. Schram, chairman. (K general, T23, CN)

182-K. Welding in Marine Engineering. H. N. Pemberton. *Engineer,* v. 195, Jan. 23, 1953, p. 131-133; Jan. 30, 1953, p. 160-162. (Concluded.)

History of welding, various applications, and several examples of weld repairs. Photographs and diagrams. (K general, T22)

183-K. Thoriated Tungsten Electrodes Are Not Hazardous for Inert-Arc Welding. A. J. Breslin and W. B. Harris. *Industry & Welding,* v. 26, Mar. 1953, p. 37-40, 68-71.

Series of tests on possible hazards of using thoriated W electrodes in inert gas-shielded arc welding. (K1, W)

184-K. Here's How Spot Welding Builds Air-Tight Electrical Panels. Andrew Wyzeenbeek. *Industry & Welding,* v. 26, Mar. 1953, p. 49-52.

Advantages and procedure for assembly of hermetically sealed electrical feed-through terminals by annular projection, spot projection, and spot welding. (K3)

185-K. Welding of High Alloys Doubled With New Roll-Spot Technique. J. R. Fullerton. *Materials & Methods,* v. 37, Feb. 1953, p. 166, 168, 170.

Improved weld quality and increased welding speeds are achieved by modifying the drive mechanism of standard seam welders. Stainless steel, Inconel X and W, Haynes Stellite No. 25, and other crack-sensitive alloys were used. (K3, SS, Ni, Co)

186-K. Fabricated Diesel Engine Components. *Welding and Metal Fabrication,* v. 21, Feb. 1953, p. 40-45.

Assembly and welding of diesel bedplates. Photographs and diagrams. (K general, T25)

187-K. Projection Welding Studs and Bosses. R. Bushell. *Welding and Metal Fabrication,* v. 21, Feb. 1953, p. 55-57.

Reviews process and determines range of machined parts which may be satisfactorily welded in production. Diagrams and micrographs. (K3)

188-K. Welding Heavy Sections of Mild Steel. R. R. Roberts. *Welding and Metal Fabrication,* v. 21, Feb. 1953, p. 63, 68.

How weld metal cracking can be avoided when welding heavy sections of mild steel. Recommendations for plates greater than 1½ in. (K general, CN)

189-K. Applications of Welding in France. (Concluded.) G. d'Herbemont. *Welding and Metal Fabrication,* v. 21, Feb. 1953, p. 64-68.

Recent French developments in welding for naval construction, aircraft production, civil engineering equipment, construction of machine frames, and repairs. (K general)

190-K. (Dutch) **Arc Extinction in Alternating Current Arc Welding.** K. K. Zwart. *Smit Mededelingen,* v. 7, Oct.-Dec. 1952, p. 144-149.

An oscillographic study was made of "arc extinction" during a.c. welding. When voltage necessary for ignition is less than voltage available from transformer the arc will be reignited. (K1)

191-K. (Dutch) **Productivity in Manual Electric Welding.** W. A. J. Nolen. *Smit Mededelingen,* v. 7, Oct.-Dec. 1952, p. 158-162.

Several ways of increasing productivity in arc welding shops. (K1)

192-K. Metal-Bonding. R. Clements. *Aircraft Production,* v. 15, Mar. 1953, p. 76-79.

Clamping equipment designed for equal pressure-distribution. Diagrams and graphs. (K13)

193-K. Steel Fabricators Cut Costs With Automatic Welding. G. M. Mills. *Canadian Metals,* v. 16, Feb. 1953, p. 48, 50.

Application of automatic shielded-arc welding to manufacture of tanks, separators, and welded vessels. Lower production costs and improved products result. Photographs. (K1, ST)

194-K. Beryllium Copper Spot Welded Without Change in Properties. D. I. Brown. *Iron Age,* v. 171, Mar. 12, 1953, p. 142-144.

Techniques for resistance welding Berylco 25. Photographs. (K3, Cu)

195-K. Observations on Experience With Welded Ships. David P. Brown. *Journal of the American Society of Naval Engineers,* v. 65, Feb. 1953, p. 71-96.

Experience acquired with welded construction of merchant ships in U. S. prior to and during war. Diagrams. (K general, T22, CN)

196-K. The Joining of Aluminium and Its Alloys. W. V. Binstead. *Metallurgia,* v. 47, Feb. 1953, p. 81-88.

Various methods of welding, brazing, and soldering. Advantages and disadvantages in each case. Photographs. (K general, Al)

197-K. Welding Structural Magnesium With a 50-50 Mixture of Helium and Argon. C. Ridgely Kemp. *Welding Engineer,* v. 38, Mar. 1953, p. 39-41, 46.

Fabrication of Mg ramps. Development of welding techniques. Photographs. (K1, Mg)

198-K. Will Inert-Gas Metal-Arc Save Money on Mild Steel? G. C. Christopher and R. C. Becker. *Welding Engineer,* v. 38, Mar. 1953, p. 42-46.

Investigation to determine adequate welding procedure. Tables and graphs. (K1, CN)

199-K. Heavy Weldments Call for Careful Welding and Planning. Clyde B. Clason. *Welding Engineer,* v. 38, Mar. 1953, p. 48-50.

Use of submerged welding to fabricate austenitic stainless steel marine equipment. Also welding chain links. Photographs. (K1, SS)

200-K. (Spanish.) **Influence of the Degree of Deoxidation and the Nitrogen Content of the Deposited Metal in the Arc Welding of Carbon Steels.** José Maria Sistiaga. *Ciencia y Tecnica de la Soldadura,* v. 11, Sept.-Oct. 1952, 18 pages.

A theoretical study. Macrographs, tables, and charts. 29 ref. (K1, CN)

201-K. (Spanish.) **Welded Construction of Three Gas-Purification Columns Subjected to Pressure.** M. de Miro Ramonacho. *Ciencia y Tecnica de la Soldadura,* v. 11, Sept.-Oct. 1952, 11 pages.

Features, calculations and various testing processes. Micrographs, tables, and diagrams. (K9)

202-K. (Book.) **Pocket Manual of Arc Welding.** Lew Gilbert, ed. 172 pages. Industrial Book Co., 1240 Ontario St., Cleveland 13, Ohio. $1.25.

Features "how-to" information on welding of mild, alloy, stainless steels; and hard surfacing and welding of other ferrous metals. Includes chapters on causes and cures of common welding troubles; welding symbols and how they are used; simple qualification tests for operators; and types of joints and typical welding positions. (K1, CI, AY, SS)

203-K. (Book.) **Welding Practice. v. 2. Welding of Ferrous Metals.** 198 pages. Butterworth's Scientific Publications Ltd. 4-6 Bell Yard, Temple Bar, London W. C. 2, England. 22s. 6d.

Each of the seven chapters is built around metallurgical factors, guidance to designers, welding materials, workshop practice, and special applications. Chapters deal with welding of mild steel by metallic-arc process; mild steel welding by processes other than metallic arc; welding of low alloy and Cr-Ni steels; welding of cast iron; weld details for pressure vessels; and hard surfacing by welding methods. (K general, ST, CI)

L

CLEANING, COATING AND FINISHING

141-L. Processing Silverplate. *Canadian Chemical Processing,* v. 37, Feb. 1953, p. 36, 38, 40.

Cleaning, buffing, and plating; with accent on mechanization and automatic equipment. Photographs. (L17, Cu, Ag)

142-L. Electrodeposition of Zinc-Tin Alloy. A Summary of Recent Work in Italy. *Chemical Age,* v. 68, Feb. 7, 1953, p. 253-254.

Preliminary study of Zn and Sn-plating baths, each containing free cyanide and NaOH, which result in an electrolyte when they were mixed but retain characteristics of separate baths. (L17, Zn, Sn)

143-L. Glassed Steel. E. A. Sanford and O. J. Britton. *Chemical Engineering,* v. 60, Mar. 1953, p. 294, 296, 298, 300, 302-304.

Properties of glass-coated steel and resistance to a number of corrosives. Diagrams and photographs. (L27, CN)

144-L. Painting Metal Containers Electrostatically. Sam Lodovico. *Industrial Finishing,* v. 29, Feb. 1953, p. 26-28, 30-31.

Metal cleaning, rustproofing, infrared dry-off, electrostatic spraying of heated materials, and convection oven baking in conveyerized setup for spraying protective coatings over inside and outside surfaces of two kinds of sheet steel containers. Photographs. (L26, CN)

145-L. High Temperature Ceramic Coatings Have Double Importance. P. M. Klauber. *Industrial Gas,* v. 31, Feb. 1953, p. 3-5, 27-28.

Use of ceramic coatings for jet parts which must withstand high-temperature oxidation and corrosion. (L27, R2, AY)

146-L. Can You Use These New Metal Finishing Ideas? *Iron Age,* v. 171, Feb. 26, 1953, p. 132-136.

Disposal of waste solutions, chemical polishing of Al, and radioactive tracers. Photographs. 50 ref. (L14, S19, A8, Al)

147-L. Oscillographic Polarographic Waves for the Reversible Deposition of Metals on Solid Electrodes. Talivaldis Berzins and Paul Delahay. *Journal of the American Chemical Society,* v. 75, Feb. 5, 1953, p. 555-559.

Equation is derived. Theoretical results are compared with experimental data, and discrepancies are accounted for by variations of activity of deposit. (L17, Cd)

148-L. Quality Control Applied to Metal Finishing. Alan Whittaker. *Machinery,* v. 82, Feb. 6, 1953, p. 254-255.

General discussion of process control, suitability of plant, personnel, supervision, and inspection. (L general)

149-L. Operation of Hot Air Baking Equipment. Leo Walter. *Organic Finishing,* v. 14, Feb. 1953, p. 9-12.

Efficiency of drying can be achieved or increased with existing baking equipment, if theory of hot air drying of coatings is understood. Diagrams. (L26)

150-L. Pipe Protection With Unbonded Coatings. Richard Sneddon.

Petroleum Engineer, v. 25, Feb. 1953, p. D12, D14, D16.

Advantages of using two separate coats with no bond between, which neutralizes shear stresses and lateral shocks. (L26, CN)

151-L. Electro-Deposited Rhodium. *Times Review of Industry*, v. 7, Feb. 1953, p. 30.

Development of Rh as an industrial finish. (L17, Rh)

152-L. Design of an Oil Fired Galvanizing Furnace. William D. Bawden. *Wire and Wire Products*, v. 28, Feb. 1953, p. 151-154, 222.

Procedure for determining size, shape, and design of pots and furnaces. Photographs and tables. 6 ref. (L16, Zn)

153-L. (French.) **Contribution to the Knowledge of Processes for the Electrolytic Polishing of Metals.** R. Piontelli and G. Bianchi. *Proceedings of the Third Meeting, Berne 1951*, International Committee of Electrochemical Thermodynamics and Kinetics, p. 160-196; disc., p. 196-197.

Experiments in which technique is based on cylindrical form of cell, thus assuring a uniform current density; liaison of anode with a reference electrode so as to form a "tensiometric pile" whose e.m.f is measured or recorded separately; temperature control; and electric supply to assure a constant current density. Theoretical discussion, diagrams, and tables. 11 ref. (L13)

154-L. (German.) **Practical Application of the Metal-Spraying Process in Foundries.** H. Reininger. *Giesserei*, v. 39, Dec. 25, 1952, p. 673-678.

Coating of foundry equipment by metalizing gives good corrosion protection. Shows that metal model plates can be improved by spraying and life of apparatus exposed to extreme heat is lengthened. Photographs and micrographs. 14 ref. (L23, E general)

155-L. (German.) **The Surface of Electrolytically Polished Magnesium.** K. Huber and H. Flückiger. *Proceedings of the Third Meeting, Berne 1951*, International Committee of Electrochemical Thermodynamics and Kinetics, p. 123-126; disc., p. 126-127.

Electrolytically polished surfaces may be examined by using either lacquer or polystyrol. These two processes are compared. (L13, Mg)

156-L. Electric Heat Pays Off for Galvanizing. John S. Case and G. H. Hoffman. *Electrical World*, v. 139, Mar. 9, 1953, p. 96-97.

Installation and advantages of electrically heated galvanizing kettles. Products receive more uniform finish and kettle failures are eliminated. (L16, Zn)

157-L. Pickling and Bright Dipping of Copper and Copper-Rich Alloy Components. E. E. Halls. *Electroplating and Metal Finishing*, v. 6, Jan. 1953, p. 43-50.

Effect of different acids and acid mixtures and most suitable treatments for specific purposes. Tables. (L12)

158-L. New Flame Plating Process Protects Metal Parts From Wear, Abrasion. *Industry & Welding*, v. 26, Mar. 1953, p. 90, 92-95.

Process whereby steel, cast iron, Al, Cu, bronze, Ti, and Mg can be coated with powdered WC. Discusses elasticity, thermal, and mechanical shock resistance of the coating. Photographs. (L22, CI, Al, Cu, Ti, Mg, W, C-n)

159-L. Coatings for Steel Water Pipe. Walter H. Cates. *Journal American Water Works Association*, v. 45, Feb. 1953, p. 103-112.

Assembles and summarizes present knowledge on effectiveness and approximate cost of available coating materials. Discussion is confined to steel water pipe 4 in. or

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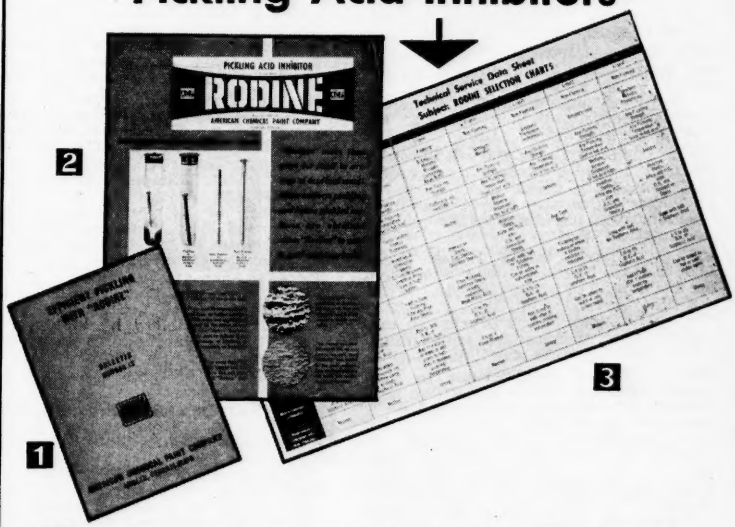

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more in diameter. Tables. 15 ref. (L26, CN)

160-L. Cement-Mortar Linings and Coatings for Steel Pipe. R. C. Kennedy. *Journal American Water Works Association*, v. 45, Feb. 1953, p. 113-115.

Process for applying coatings and principal characteristics for the pipe. (L26, CN)

161-L. Antifouling Paints for Aluminum Alloys Used in Shipbuilding. John C. Kingcome. *Light Metals*, v. 16, Feb. 1953, p. 48-52.

Reviews development of antifouling paints used in England and by U. S. Navy. Photographs. 12 ref. (L26, R4, Al, Zn, Cu, Hg)

162-L. Phosphating. Performance and Control. R. J. Brown. *Metal Industry*, v. 82, Feb. 1953, p. 125-128.

Type of cleaner and rinse solutions. Some problems likely to occur. Photographs. (L14)

163-L. Small Parts Barrel Through Plating. Herbert Chase. *Steel*, v. 132, Feb. 23, 1953, p. 88-90.

Three automatic barrel machines which form backbone of Zn plating line. (L17, Zn)

164-L. Flame-Plating Hikes Wear Life of Base Metal. Opens New Field for Utilizing Tungsten Carbide. *Western Metals*, v. 11, Feb. 1953, p. 56-58.

Applications of the process in machine tool or manufacturing industry. Photographs. (L17, W, C-n)

165-L. Kel-F Applications in Corrosive Systems. Louis C. Rubin and Wilber O. Teeters. *Corrosion*, v. 9, Mar. 1953, p. 100-102.

Plastic coatings for metals exposed to corrosive systems. (L26)

166-L. Electronics Enter Porcelain Enameling Field. J. L. McLaughlin. *Finish*, v. 10, Mar. 1953, p. 30-31, 95-96.

Progress report on use of electrostatic spraying for porcelain enameling of appliance parts. Promising work was done and successive trials showed consistent improvements. Photographs. (L27, CN)

167-L. Blast Cleaning Sanitary Ware Castings. Eugene F. Anderson. *Finish*, v. 10, Mar. 1953, p. 42-43.

How a Canadian manufacturer cleans castings prior to enameling. Photographs. (L10)

168-L. Electrodeposition of Tin-Nickel Alloy Plate From Chloride-Fluoride Electrolytes. J. W. Cuthbertson, N. Parkinson, and H. P. Rooksby. *Journal of the Electrochemical Society*, v. 100, Mar. 1953, p. 107-119.

Laboratory research. Tables and graphs. (L17, Sn, Ni)

169-L. Electrodeposition Behavior of Cadmium and of Thallium at Mercury Cathodes. L. B. Rogers and Charles Merritt, Jr. *Journal of the Electrochemical Society*, v. 100, Mar. 1953, p. 131-135.

Deposition behavior from approximately millimolar solutions of Tl and Cd at a Hg cathode can be predicted within 10 mv from polarographic data. Tables. (L17, Tl, Cd)

170-L. Wet Blasting for Precision Surfacing and Finishing Operations. Eugene F. Anderson. *Machine and Tool Blue Book*, v. 49, Mar. 1953, p. 162-164, 166, 168, 170-174.

Process which results in better surface qualities and less manual labor. (L10)

171-L. Life of Metal Plungers Increased by Hard-Facing. L. V. LaRou. *Machine and Tool Blue Book*, v. 49, Mar. 1953, p. 227-230.

Briefly describes process and compares advantages with those of untreated cast iron. Photographs. (L24, CI)

172-L. Alkaline Cleaning for Metal Finishing. Allen G. Gray. *Metal Progress*, v. 63, Feb. 1953, p. 84-87.

Discusses alkali cleaning with respect to soak tank, electrolytic, and spray cleaning. Tables and diagrams. (L12)

173-L. Investigation of Gases Evolved During Firing of Vitreous Coatings on Steel. Dwight G. Moore and Mary A. Mason. *National Advisory Committee for Aeronautics*, Technical Note 2865, Jan. 1953, 34 pages.

Investigation included examination of gas evolution during firing, changes in bubble structure with firing time, and changes in normal gas evolution when waterfree enamels were used. Analysis of gases trapped in bubble structure after varying firing times; source of C gases in bubble structure using C^{14} as a tracer; and effect of various pretreatments on resulting bubble structure of fired specimens were determined. Tables. (L27, ST)

174-L. A Theory of Hydrogen Overvoltage and Its Relation to the Electrodeposition of Metals. George Dubpernell and Roberta Dubpernell. *Plating*, v. 40, Jan. 1953, p. 53-58; Feb. 1953, p. 151-154, 159.

Theory of H_2 overvoltage is proposed and it is suggested that it is not due to H_2 but to electrodeposition of electronegative metal impurities such as Na. History of subject is reviewed, and an explanation is offered of the bonded structures frequently exhibited by bright electrodeposits. Relation to electrodeposition of metals and structure of deposits. Graphs and tables. 70 ref. (L17)

175-L. Selenium Rectifiers for Electroplating. F. A. Waelterman and L. W. Reinken. *Plating*, v. 40, Mar. 1953, p. 254-259.

Manufacture of Se rectifier cells and stacks. Concludes with brief description of complete power supply units incorporating Se stacks. Photographs. (L17, Se)

176-L. Polarographic Determination of Lead in Lead Plating Solutions. Rafael Diaz. *Plating*, v. 40, Mar. 1953, p. 261-262.

Reagents, apparatus, and procedure. Method is compared with gravimetric methods. (L17, S11, Pb)

177-L. Comments on the Finishing of Titanium. John Starr. *Products Finishing*, v. 17, Mar. 1953, p. 38-40, 42.

Problems encountered and suggests satisfactory methods for cleaning Ti. (L general, L12, Ti)

178-L. How to Select a Surface Active Agent for Use in Metal Cleaning. Allen G. Gray. *Products Finishing*, v. 17, Mar. 1953, p. 46, 48, 50.

Brief description with emphasis on detergency. (L12)

179-L. Plating With the Platinum Group Metals. Allen G. Gray. *Products Finishing*, v. 17, Mar. 1953, p. 50, 52, 54, 58, 60, 62, 66.

Uses, plating baths, and procedure for Rh, Pt, and Pd. (L17, Rh, Pt, Pd)

180-L. Cold Cleaner Cuts Costs. D. C. Miner. *Steel*, v. 132, Mar. 16, 1953, p. 100-101.

New combination of alkali-solvent-wetting agent is effective in power washers at room temperature. Mixture is particularly suited for light cleaning jobs with no encrusted oils. Photographs. (L12)

181-L. (French.) **Cleansing and Preparation of Metallic Surfaces, Particularly Cast Iron.** J. Guingand and J. Ginguené. *Métaux Corrosion—Industries*, Nov. 1952, p. 463-471.

Discusses Kolene-Heurtey and other electrical processes. (L12, CI)

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182-L. (Book.) **Journal of the Electrodepositors' Technical Society.** v. 27. 337 pages. Institute of Metal Finishing, 32, Great Armond St., London, W. C. 1. 42s, 0d.

Consists of papers covering tin and tin-plating; surface defects in steel; discontinuities in metallic coatings; crystal structures of deposits; corrosion resistance; design of automatic plating plant; bright tin-nickel plating; plating tube bores; zincate process for Al; analysis of solutions by chromatography; and several others.
(L17, M26, R general, Sn, CN, Al, Zn)

183-L. (Book—French.) **International Committee of Electrochemical Thermodynamics and Kinetics. "Proceedings of the Third Meeting, Berne 1951".**) Comité International de Thermodynamique et de Cinetique Electrochimiques. "Comptes Rendus de la III° Reunion". 495 pages. 1952. Carlo Manfredi, Milan, Italy.

Consists of individual papers on electrochemical behavior of metals and metalloids; electric double layer; electrochemical nomenclature and definitions; and organization of the committee. Papers are abstracted individually. (L17, P15)

M

METALLOGRAPHY, CONSTITUTION AND PRIMARY STRUCTURES

96-M. Effect of Liquid Metal Temperature on Grain Size of High Manganese Steel. S. L. Gertsman. *American Foundryman*, v. 23, Feb. 1953, p. 48.

Brief report throws light on controversy concerning influence of liquid metal temperature on Hadfield's Mn steel. Photographs. (M27, ST)

97-M. The Scanning Electron Microscope and the Electron-Optical Examination of Surfaces. D. McMullan. *Electronic Engineering*, v. 25, Feb. 1953, p. 46-50.

Use for examining metal surfaces. Al was used in experiments. 13 ref. (M21, Al)

98-M. The System InAs-InSb. C. Shih and E. A. Peretti. *Journal of the American Chemical Society*, v. 75, Feb. 5, 1953, p. 608-609.

Presents phase diagram obtained by thermal analysis, X-ray, and metallographic studies. (M24, In, As, Sb)

99-M. Etch-Pits and Dislocations. R. Gevers. *Nature*, v. 171, Jan. 24, 1953, p. 171-172.

Suggests that etching at dislocations will take place following a mechanism which is analogous to Frank mechanism for growth. 3 ref. (M26)

100-M. Dislocations and the Theory of Solids. N. F. Mott. *Nature*, v. 171, Feb. 7, 1953, p. 234-237.

Developments in theory for understanding crystal growth, grain boundaries, and chemical reactions in solids. Diagrams and micrographs. 41 ref. (M26)

101-M. Note on the Electronic Structure of the Transition Metals. N. F. Mott. *Philosophical Magazine*, v. 44, Feb. 1953, p. 187-190.

Discussion of Van der Waals forces between 3*d* and 4*d* shells of transition metals. It is shown that a consideration of their nature may account for low number of conduction electrons in these metals and their alloys. Ni, Co, and Pd were used. (M25, P15, Ni, Co, Pd)

102-M. (Italian.) Application of X-Ray Spectrometer Geiger-Müller for the Direct Determination of the Velocities of Structural Transformations. U. Rösler and W. Ruff. *Alluminio*, v. 21, Dec. 1952, p. 573-593.

New method for radiographic study of the kinetics of structural transformations at elevated temperatures. Reports isothermal transformations of Al bronze. Tables, graphs, and diagrams. 25 ref. (M23, Al, Cu)

103-M. Screw Dislocations in Thin Rods. J. D. Eshelby. *Journal of Applied Physics*, v. 24, Feb. 1953, p. 176-179.

Properties of a screw dislocation in a cylinder are worked out in comformance with Galt and Herring's observations on thin whiskers of Sn. (M26, Sn)

104-M. X-Ray Studies on the Texture of Crystals. V. M. Padmanabhan. *Journal of the Indian Institute of Science*, v. 35, sec. A, Jan. 1953, p. 1-8.

Method of studying crystalline texture employing internal reflections. Ground, etched, and chilled crystals of LiF were used. 15 ref. (M26)

105-M. The Use of Diamond Dust for Metallographic Polishing. L. G. Tottle. *Journal of the Institute of Metals*, v. 81, Feb. 1953, p. 146-150.

Experiments on above and advantages. (M21, Ni)

106-M. Uses of the Hot-Stage Microscope. P. J. E. Forsyth. *Journal of the Institute of Metals*, v. 81, Feb. 1953, p. 150-151.

Brief discussion on the reflecting microscope objective which has the advantage of large working distance, with the retention of a useful degree of resolution in the optical system. (M21)

107-M. The Use of Geiger Counters in X-Ray-Diffraction Studies. G. K. Williamson. *Journal of the Institute of Metals*, v. 81, Feb. 1953, p. 152-157.

Various methods for using Geiger counters and similar devices for direct detection of X-ray intensity. (M22)

108-M. The Constitution of Chromium-Manganese Alloys Below 1000° C. W. B. Pearson and W. Hume-Rothery. *Journal of the Institute of Metals*, v. 81, Feb. 1953, p. 311-314.

Microscopic and X-ray studies in which structures were obtained after annealing 5-71 days. Lattice spacings of solid solution of Mn in α-Cr were determined. Micrographs. (M24, Cr, Mn)

109-M. Line Broadening of Martensite in Nickel Steels. R. A. Smith. *Journal of the Iron and Steel Institute*, v. 173, Feb. 1953, p. 147-152.

X-ray diffraction-line shapes obtained from quenched medium and low-carbon Ni steels which were recorded in a Geiger counter spectrometer. Fourier analysis was used to determine true physical broadening from observed line shapes of martensite and annealed iron. Graphs and tables. 14 ref. (M22, AY)

110-M. Formation of Solid Solutions of Metallic Compounds. I. I. Kornilov. *Metal Progress*. v. 63, Jan. 1953, p. 190, 192. (Translated and condensed by A. G. Guy.)

Previously abstracted from *Doklady Akademii Nauk SSSR*. See item 138-M, 1952. (M26)

111-M. Uranium-Graphite Lattices. E. A. Guggenheim and M. H. L. Pryce. *Nucleonics*, v. 11, Feb. 1953, p. 50-60.

Details of methods and results of calculations for seven important quantities, including critical amount of U, reproduction constant, and migration length. (M26, U)

112-M. (German.) Concerning Research Films for Publication. Willi Kuhl. *Mikroskopie Zentralblatt für Mikroskopische Forschung und Methodik*, v. 7, no. 9/10, 1952, p. 296-344.

Methods of perfecting and improving motion pictures for research use. Application to cytological problems is given greatest attention but examples of use in physics, chemistry, metallurgy, and engineering are mentioned. Numerous ref. (M23)

113-M. The Crystal Structure and Superconductivity of Lanthanum. W. T. Ziegler, R. A. Young, and A. L. Floyd, Jr. *Journal of the American Chemical Society*, v. 75, Mar. 5, 1953, p. 1215-1221.

Crystal structure was studied by powder X-ray diffraction techniques at room temperature. The existence of the hexagonal close-packed and face-centered cubic modifications was confirmed. Graphs and tables. 30 ref. (M26, P15, La)

114-M. Preferential Etch for Use in Optical Determination of Germanium Crystal Orientation. R. H. Wynne and Colman Goldberg. *Journal of Metals*, v. 5, Mar. 1953; *Transactions of American Institute of Mining and Metallurgical Engineers*, v. 197, 1953, p. 436.

Brief description. (M21, M26, Ge)

115-M. Grain Boundary Films in Boron Steels. J. W. Spretnak and Rudolph Speiser. *Journal of Metals*, v. 5, Mar. 1953; *Transactions of American Institute of Mining and Metallurgical Engineers*, v. 197, 1953, p. 445-446.

Possibility of a continuous film of B around grains in steels containing 0.0005 to 0.003% B and with ASTM grain sizes from No. 1 through No. 10. Tables. (M27, AY)

116-M. (French.) Irregularities of the Austenitic Grain Size According to the McQuaid Sense. M. Achard. *Circulaire d'Informations Techniques*, v. 10, 1953, p. 131-138.

Causes and remedies. (M27)

117-M. (French.) The Phases of the Al-Fe-Si Ternary System. Marcel Armand. *Comptes Rendus Hebdomadaires des Séances de L'Académie des Sciences*, v. 235, Dec. 10, 1952, p. 1506-1508.

Liquation method of separating metals in above system. 9 ref. (M24, C28, Al, Fe, Si)

118-M. (English.) The Neutron-Proton Systems With a Central Exponential Potential. Part I. P. O. Brundell and B. Enander. *Kungl. Tekniska Högskolans Handlingar (Transactions of the Royal Institute of Technology)*, Stockholm, Sweden, No. 60, 1952, 12 pages.

Theoretical analysis. (M25)

N

TRANSFORMATIONS AND RESULTING STRUCTURES

67-N. Crystallization and Heat Transfer in a Stream of Liquid Metal Flowing Along the Surface of a Mould. E. W. Fell. *Proceedings of the General Discussion on Heat Transfer*, Sept. 1951, p. 276-278.

Determines heat transfer in streams of molten metal and in molds, to elucidate solidification process. Temperature distribution in streams of different melts is calculated for laminar or Poiseuille flow for a boundary layer along a flat surface for 2-dimensional motion. Deals with more simple types of motion and not with turbulence. Graphs. (N12, E25)

68-N. The Effect of Added Metallic Impurity and of Closed Moulds on the Growth From the Melt of Single Crystals of Tin. A. J. Goss. *Proceedings of the Physical Society*, v. 66, sec. B, Feb. 1, 1953, p. 65-73.

Experiments on crystallization of binary alloys of tin. 10 ref. (N12, Sn)

69-N. Effect of Lead and Nickel on Grain Size of Certain Cast Copper-Base Alloys. R. A. Colton, F. L. Turk, and D. L. LaVelle. *Transactions of the American Foundrymen's Society*, v. 60, 1952, p. 605-610; disc., p. 610.

Experiments were conducted to determine qualitatively effect on grain size of Pb in cast Cu, and Ni in a commonly used Cu-Sn alloy. Experimental method which minimizes cooling rate as a variable was used. (N3, Pb, Ni, Cu)

70-N. Effect of Hydrogen on Graphitization. F. Brown and M. F. Hawkes. *Transactions of the American Foundrymen's Society*, v. 60, 1952, p. 635-639; disc., p. 639-640.

Reviews previous work and continues with experimental account of α-range graphitization, stable eutectoid reaction, and subcritical graphitization of cementite. Micrographs. 13 ref. (N8, CI)

71-N. The Effect of the Rate of Cooling on the Allotropic Transformation Temperatures of Uranium. Pol Duwez. *Journal of Applied Physics*, v. 24, Feb. 1953, p. 152-156.

Measurement of allotropic transformation temperatures with rates of cooling varying from 5 to 8000° C. per sec. Graphs and tables. 18 ref. (N6, U)

72-N. (French.) Study of the Order-Disorder Modification in the Cu-Pt Alloys. Gérard Fournet. *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences*, v. 235, Dec. 1, 1952, p. 1377-1379.

Transition from order to disorder in Cu-Pt alloys takes place without notable redistribution of first neighbors. Good agreement was found with experimental data when it was supposed that difference $W(r_1)$ of energies of similar and dissimilar pairs, with relation to second neighbors was larger than term $W(r_1)$ which corresponds to first neighbors. (N10, Cu, Pt)

73-N. (French.) A Process for the Study of Reactions Between Gas and Solids. Application to the Iron-Carbon-Hydrogen System. Louis Beaujard, Gaston Collette, and Léon Jacqué. *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences*, v. 235, Dec. 1, 1952, p. 1388-1390.

Reports on a method for study of equilibrium and rate of reactions at elevated temperatures between solid and gaseous phases. The equilibrium constants calculated by Austin and Day are confirmed. (N15, Fe,)

74-N. (French.) Rapid Tempering of Steels. André Henri Michel and Jean Papier. *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences*, v. 235, Dec. 1, 1952, p. 1398-1400.

Decomposition of residual austenite in W18 Cr 4V2 steel at temperatures below 400° C. was studied by various methods. Results are charted. (N8, TS)

75-N. The Diffusion and Solubility of Nitrogen in Beta Zirconium. M. W. Mallett, E. M. Baroody, H. R. Nelson, and C. A. Papp. *Journal of the Electrochemical Society*, v. 100, Mar. 1953, p. 103-106.

Study was made from 900 to 1600° C. at 1 atm. Limiting solubilities of N_2 in β/Zr were determined from diffusion data. Graphs. 8 ref. (N1, Zr)

76-N. Some Applications of the Thermodynamic Theory of Irreversible Processes to Physical Metallurgy. E. S. Machlin. *Journal of Metals*, v. 5, Mar. 1953; *Transactions of American Institute of Mining and Metallurgical Engineers*, v. 197, 1953, p. 437-445.

Extension of thermodynamic

theory was made for irreversible growth processes occurring by motion of an interface. Theory is applicable to diffusion; recrystallization; continuous grain growth; growth of carbides; eutectoid products; and in solidification; recovery; "slipless" flow; etc. 19 ref. (N1, N3, N4, N5, N12, P12)

P

PHYSICAL PROPERTIES AND TEST METHODS

98-P. Butterfly Curve Tracer for Magnetic Materials. George M. Ettinger. *Electronics,* v. 26, Mar. 1953, p. 119-121.

Instrument meets needs for rapid and accurate means of determining properties of magnetic materials in expanding use of saturable reactors. Diagrams. 6 ref. (P16)

99-P. Adsorption of Calcium and Sodium on Pyrite. A. M. Gaudin and W. D. Charles. *Mining Engineering,* v. 5, Feb. 1953, p. 195-200.

Work includes evaluation of effect of dissolved O_2; concentration of Ca, Na, and H_2; and anions present on adsorption of Ca and Na. Graphs and tables. 13 ref. (P13, B14, Ca, Fe)

100-P. Effects of Water Vapour on the Electrical Properties of Anodized Aluminium. F. Ansbacher and A. C. Jason. *Nature,* v. 171, Jan. 24, 1953, p. 177-178.

Experiments on change of capacity in condensers. (P15, Al)

101-P. Electron-Induced Showers in Copper. Asher Kantz and Robert Hofstadter. *Physical Review,* v. 89, Feb. 1, 1953, p. 607-617.

Experimental determination was made of radial and longitudinal distribution of energy produced in showers initiated by electrons of 118 Mev and 157 Mev in Cu. A CsBr(Tl) crystal coupled to a thin light pipe and photomultiplier was used as a probe. Graphs of radial distributions are given from which curves are determined. 14 ref. (P15, Cu)

102-P. Magnetic Crystal Anisotropy and Magnetostriction of Iron-Nickel Alloys. R. M. Bozorth and J. G. Walker. *Physical Review,* v. 89, Feb. 1, 1953, p. 624-628.

Single crystals of Fe-Ni alloys were prepared and measurements made of magnetic crystal anisotropy. Magnetostriction at saturation in different crystallographic directions dependent on rate of cooling of specimens after annealing was measured. Graphs. 18 ref. (P16, Fe, Ni)

103-P. Some Properties of Superconductors Below 1° K. T. S. Smith, W. B. Gager, and J. G. Daunt. *Physical Review,* v. 89, Feb. 1, 1953, p. 654.

Ti as a crystal bar was used in the experiments. (P15, Ti)

104-P. (German.) **Contribution to the Potential-pH Diagram of Cadmium in Solutions Containing Chloride.** W. Feitknecht and R. Reinmann. *Proceedings of the Third Meeting, Berne 1951,* International Committee of Electrochemical Thermodynamics and Kinetics, p. 93-101; disc., p. 101.

Modifications of pH solubility and potential-pH diagrams, which are brought about by the fact that in several divalent metals, such as Cu, Zn, Cd, and Pb, anions of the solutions may enter into reaction while forming basic salts. Tables and graphs. 9 ref. (P15, Cd, Cu, Zn, Pb)

105-P. (French.) **Electrochemical Potentials of Niobium, Tantalum, and Protactinium in Hydrofluoric Solution.** M. Haissinsky. *Proceedings of the Third Meeting, Berne 1951,* International Committee of Electrochemical Thermodynamics and Kinetics, p. 222-224; disc., p. 224.

Brief theoretical discussion. (P15, Cb, Ta, Pa)

106-P. (French.) **Critical Potentials of Electrolytic Deposits in the Radioactive Indicators Scale.** M. Haissinsky. *Proceedings of the Third Meeting, Berne 1951,* International Committee of Electrochemical Thermodynamics and Kinetics, p. 214-220; disc., p. 220-221.

Summarizes experimental results. Tabular data. 26 ref. (P15, Pb, Ag, Zn, Po)

107-P. Hall Effect Modulators and "Gyrators" Employing Magnetic Field Independent Orientations in Germanium. W. P. Mason, W. H. Hewitt, and R. F. Wick. *Journal of Applied Physics,* v. 24, Feb. 1953, p. 166-175.

Uses for Hall effect in Ge crystals include measuring magnetic flux, producing pure product modulator, and in nonreciprocal transmission. Photographs and diagrams. (P15, Ge)

108-P. Physical Adsorption on Single Crystal Zinc Surfaces. T. N. Rhodin. *Journal of Physical Chemistry,* v. 57, Feb. 1953, p. 143-148.

Adsorption studies on Cu were extended to nitrogen and argon adsorption on single-crystal Zn surfaces. Differences in adsorption between a monatomic and a diatomic gas on each of two metal surfaces with same crystallography but with different atomic spacings and hence different surface electron configurations. Graphs. 28 ref. (P13, Cu, Zn)

109-P. Alteration of Surface Properties of Gold and Silver as Indicated by Contact Angle Measurements. F. E. Bartell and J. T. Smith. *Journal of Physical Chemistry,* v. 57, Feb. 1953, p. 165-171; disc., p. 171-172.

Determines and correlates tension or energy differences for Ag and Au surfaces exposed to various vapors, gases and liquids. Diagrams and tables. (P13, Au, Ag)

110-P. Adsorption Studies on Metals. I. Physical and Chemical Adsorption of Gases on Molybdenum. F. H. Healey, J. J. Chessick, and A. C. Zettlemoyer. *Journal of Physical Chemistry,* v. 57, Feb. 1953, p. 178-182.

Heterogeneous nature of Mo powder surface, both before and after reduction of surface oxide, was studied by measurements of physical and chemical adsorption of gases. Procedure for reduction and degassing of Mo powder was developed which gives a metal surface apparently free of chemisorbed O_2 and H_2. Tables and graphs. 9 ref. (P13, Mo)

111-P. The Anodic Behavior of Antimony. S. E. S. El Wakkad and A. Hickling. *Journal of Physical Chemistry,* v. 57, Feb. 1953, p. 203-206.

Study of anodic polarization of Sb in acid and alkaline solutions. Graphs. 14 ref. (P15, Sb)

112-P. Paramagnetic Relaxation in Metals. Albert W. Overhauser. *Physical Review,* v. 89, Feb. 15, 1953, p. 689-700.

Paramagnetic relaxation time of electron spins in a metal is calculated. Relaxation processes due to interaction with lattice vibrations, nuclear spins, other electrons, and impurity atoms are treated. (P16)

113-P. An Anomalous Critical Current Effect in Superconducting CbN. Floyd C. Haley and Donald H. Andrews. *Physical Review,* v. 89, Feb. 15, 1953, p. 821-823.

Observations were made of 30 transitions from normal to superconducting state occurring in four samples of CbN over a range of current from 0.01 ma to 10 ma. 12 ref. (P15, Cb)

114-P. The Thermal Expansion of Solids. J. S. Dugdale and D. K. C. MacDonald. *Physical Review,* v. 89, Feb. 15, 1953, p. 832-834.

Brief theoretical analysis. (P11)

115-P. Combined Pairs of Vacancies in Copper. J. H. Bartlett and G. J. Dienes. *Physical Review,* v. 89, Feb. 15, 1953, p. 848-850.

Approximate theoretical calculation is given for the dissociation energy of vacancy pairs in Cu and of the activation energy required for motion of associated pairs. 13 ref. (P12, Cu)

116-P. Measurement of Magnetostriction in Single Crystals. R. M. Bozorth and R. W. Hamming. *Physical Review,* v. 89, Feb. 15, 1953, p. 865-869.

Simplified procedure for determining five magnetostriction constants of a ferromagnetic cubic crystal. Constants were determined for single crystals of Ni and a Ni-Fe alloy. Tables and graphs. (P16, Fe, Ni)

117-P. (French.) **The Spectroscopic Factors of Ferromagnetic Nickel-Copper Alloys.** A. Jean-Pierre Meyer. *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences,* v. 235, Dec. 1, 1952, p. 1382-1384.

Proposes a formula which makes it possible to calculate a spectroscopic Landé factor by determining the ferromagnetic resonance. Results are tabulated and discussed. (P16, Ni, Cu)

118-P. Standard Electrode Potential of the Iron-Ferrous Ion Couple at 25°. W. A. Patrick and W. E. Thompson. *Journal of the American Chemical Society,* v. 75, Mar. 5, 1953, p. 1184-1187.

Experimental proof of the existence of atomic hydrogen in Fe as the principal cause of the variations in the standard potential of the Fe, Fe^{++} half-cell. Diagrams and graphs. (P15, Fe)

119-P. High Temperature Heat Contents of Hafnium Dioxide and Hafnium Tetrachloride. Raymond L. Orr. *Journal of the American Chemical Society,* v. 75, Mar. 5, 1953, p. 1231-1232.

Presents table of smooth heat content and entropy increment data above 298.16° K. Heat content equations are used to represent the data. (P12, Hf)

120-P. The Electrochemistry of Gallium. William M. Saltman and Norman H. Nachtrieb. *Journal of the Electrochemical Society,* v. 100, Mar. 1953, p. 126-130.

Work to determine standard electrode potential for the gallium-gallic ion. 19 ref. (P15, Ga)

121-P. The Thermal and Magnetic Properties of Palladium-Silver Alloys. F. E. Hoare, J. C. Matthews, and J. C. Walling. *Proceedings of the Royal Society,* v. 216, ser. A, Feb. 24, 1953, p. 502-515.

Magnetic susceptibilities were measured for a series of Pd-Ag alloys from pure Pd to approximately 50 atomic % Ag, over a range of temperature from 20 to 290° K. Graphs and tables. 16 ref. (P16, Ag, Pd)

122-P. An Experimental and Theoretical Study of the Relation Between Magnetic Field and Current in a Superconductor. A. B. Pippard. *Proceedings of the Royal Society,* v. 216, ser. A, Feb. 24, 1953, p. 547-568.

Shows that the penetration depth in superconducting tin at 0° K can be varied by the addition of an impurity. Graphs. 24 ref. (P16, Sn)

123-P. (German.) **Magnetic Investigations of Diffusion in the Cu-Fe System.** A. Knappwost. *Zeitschrift für*

Elektrochemie Berichte der Bunsengesellschaft für Physikalische Chemie, v. 56, No. 8, 1952, p. 840-846.

Diffusion of Fe in supersaturated Cu-Fe mixed crystals at 300° C. was investigated. Increase of paramagnetic susceptibility of alloys during tempering was observed to stem from the Fe atoms. 10 ref. (P16, N1, Fe, Cu)

124-P. (Book.) **The Molecular Theory of Fluids.** Herbert S. Green. 264 pages. 1952. Interscience Publishers, 250 Fifth Ave., New York 1, N. Y.

Includes statistics of molecular motion, structure of fluids at rest, condensation, liquid state, structure of fluids in motion, complex fluids, fluid mixtures, equilibrium properties, kinetic theory, and quantum theory of fluids. (P10)

125-P. (Book.) **Physical Constants of Some Commercial Steels at Elevated Temperatures.** The British Iron and Steel Research Association, Metallurgy (General) Division, Thermal Treatment Sub-Committee, editors. 38 pages. Butterworth's Scientific Publications, Ltd. 4-6 Bell Yard, Temple Bar, London W. C. 2, England. 21s 0d.

Tabulates specific and total heats between 50 and 1200° C; coefficient of thermal expansion (between 0 and t° C.) up to 1100° C.; electrical resistivities between 0 and 1300° C.; thermal conductivities between 0 and 350° C.; mean coefficients of thermal expansion between t° and (t + 50)° C.; densities at elevated temperatures; and thermal diffusivities. Total heat-temperature graphs are given for ranges of temperature covering transformations. (P11, P12)

126-P. (Book.) **Proceedings of the General Discussion on Heat Transfer.** Sept. 1951. 496 pages. 1952. Institution of Mechanical Engineers, London.

Consists of 97 papers presented in London at the joint meeting of the Institution of Mechanical Engineers and the American Society of Mechanical Engineers. General sections include heat transfer with change of state; heat transfer between fluids and surfaces; conduction in solids and fluids; radiation, instrumentation, measurement techniques, and analogies; and special problems. Pertinent papers are abstracted separately. (P11, P12)

Q

MECHANICAL PROPERTIES AND TEST METHODS; DEFORMATION

194-Q. Fatigue of Ferrous Metals. A Phenomenological Approach. H. L. Cox. *Iron & Steel*, v. 26, Feb. 1953, p. 45-50.

Collection of existing experimental evidence. Introduces hypothetical conceptions to correlate known facts. Tables and graphs. (Q7, Fe)

195-Q. Ferritic Steels. Developments in Creep Resistance. J. O. Ward and J. R. Rait. *Iron & Steel*, v. 26, Feb. 1953, p. 59-62.

Creep theory, its development, early ferritic steels, ferrite strength, 3% Cr-Mo-W-V alloy, 12% Cr alloy, and heat treatment. (Q3, J general, AY)

196-Q. On Torsional-Flexural Buckling of Columns. H. L. Langhaar. *Journal of the Franklin Institute*, v. 255, Feb. 1953, p. 101-112.

Theoretical treatment based on the general theory of elastic stability. (Q28, Q1)

197-Q. On the Flexibility of Wire Ropes. Einosuke Mikumo, Tochio Aida, and Masaki Oshiumi. *Memoirs of the Faculty of Engineering, Kyoto University*, v. 14, Oct. 1952, p. 235-242.

Bending tests in which modulus of elasticity for bending rigidity showed a constant value with respect to construction, regardless of size. Tables and graphs. (Q5)

198-Q. Failures in Welded Ships. *National Bureau of Standards Technical News Bulletin*, v. 37, Feb. 1953, p. 24-29.

Causes of structural failures and basic factors involved in prevention. Diagrams, photographs, and tables. (Q26, K9, ST)

199-Q. Exudation of Material From Slip Bands at the Surface of Fatigued Crystals of an Aluminium-Copper Alloy. P. J. E. Forsyth. *Nature*, v. 171, Jan. 24, 1953, p. 172-173.

Brief discussion. Diagrams. 3 ref. (Q24, Al, Cu)

200-Q. A Dislocation Model for the Study of Boundary Phenomena and Deformation in Metals. W. I. Pumphrey. *Nature*, v. 171, Jan. 31, 1953, p. 218.

Construction of a dislocation model which aids investigation of deformation in a polycrystalline mass under a rapidly applied force. Micrographs. (Q24)

201-Q. Methods for Improvement of Drill-Collar Joints Evaluated by Full Size Fatigue Tests. L. E. Trishman. *Petroleum Engineer*, v. 25, Feb. 1953, p. B98, B100, B102, B105, B107-B108, B110, B112.

Basic fatigue test data, fatigue tests of nitrided notched bars, cold rolled notch fatigue tests, thread rolling, and full-size fatigue tests of threaded joints. Photographs, graphs, and diagrams. (Q7, CN)

202-Q. What Causes Stresses in Brake Beams. *Railway Locomotives and Cars*, v. 127, Feb. 1953, p. 45-48.

Laboratory and road tests conducted in conjunction with development of a one-piece cast steel brake beam for freight cars. Photographs. (Q25, T23, CI)

203-Q. Experimental Stress Analysis. J. P. Vidosic. *Research Engineer*, v. 7, Jan. 1953, p. 3-4, 15-20.

Some of the applications and methods now in use. 14 ref. (Q25)

204-Q. Investigation of Hot Tears in Steel Castings. *Transactions of the American Foundrymen's Society*, 1952, v. 60, p. 137-162.

Includes "Test Specimen for Evaluating Hot Tearing in Steel Castings", Gordon W. Johnson; "Evaluation of Hot Tear Test Casting", G. A. Lillieqvist and J. H. Fuqua; and "Hot Tear Investigation", C. H. Wyman, C. A. Faist, and Geo. Di Sylvestro. Work carried out by Armour Research Foundation, American Steel Foundry, and Burnside Steel Foundry Co. Tables, graphs, diagrams, and photographs. (Q27, CI)

205-Q. Commercial Experience With Higher Silicon Nodular Irons. Richard Schneidewind and Howard H. Wilder. *Transactions of the American Foundrymen's Society*, v. 60, 1952, p. 322-329; disc., p. 329.

Investigation to study effect of Si on ductile nodular irons. 12 ref. (Q general, E25, CI)

206-Q. Influence of Phosphorus on Hot Tear Resistance of Plain and Alloy Gray Iron. John C. Hamaker, Jr. and Wm. P. Wood. *Transactions of the American Foundrymen's Society*, v. 60, 1952, p. 501-510.

Procedure developed for tensile testing gray iron on direct cooling from liquid state in a sand mold at normal rates of strain. Method provides a means of measuring properties of gray iron shortly after solidification under actual hot tearing conditions. Graphs and photographs. 8 ref. (Q27, CI)

207-Q. Mechanical Properties of Sand Cast Magnesium-Zinc-Zirconium Alloys. J. F. Hildebrand and F. P. Strieter. *Transactions of the American Foundrymen's Society*, v. 60, 1952, p. 595-600; disc., p. 600-604.

Experiments to determine tensile strength, ductility, shear strength, bearing strength, and stress properties. Tables, graphs, and photographs. 19 ref. (Q23, Mg)

208-Q. Effect of Phosphorus Content on Graphitization Rate and Mechanical Properties of Black Heart Malleable Iron. J. E. Rehder. *Transactions of the American Foundrymen's Society*, v. 60, 1952, p. 627-633; disc., p. 634.

Literature is reviewed and summarized. New data are provided. Tables, graphs, and micrographs. 13 ref. (Q general, N8, CI)

209-Q. Effect of Percentage of Nodular Graphite on Certain Mechanical Properties of Magnesium-Treated Cast Iron. R. W. Lindsay and A. Shames. *Transactions of the American Foundrymen's Society*, v. 60, 1952, p. 650-654; disc., p. 654.

Melts were prepared by induction melting, and treated so that graphite structures in resulting castings varied from all flakes to practically all nodules. Double-treatment technique was used; Mg was added as an Fe-Si-Cu Mg alloy followed by a ferrosilicon addition. Graphs and micrographs. (Q general, E25, CI)

210-Q. Hot-Tear Formations in Steel Castings. U. K. Bhattacharya, C. M. Adams, and H. F. Taylor. *Transactions of the American Foundrymen's Society*, v. 60, 1952, p. 675-680.

Tearing was produced in a flanged casting by placing restraining bars between the flanges. Degree of restraint was controlled by means of a gap in bar. Apparatus was devised to detect time and temperature at which cracking initiates in casting. Tables, diagrams, and photographs. 23 ref. (Q26, E11, CI)

211-Q. Mechanical Properties of Spherulitic Graphite Cast Iron. C. F. Reynolds and H. F. Taylor. *Transactions of the American Foundrymen's Society*, v. 60, 1952, p. 687-713.

Purpose was to determine properties of new ferrous alloy, spherulitic cast iron, particularly effects of heat treatment and composition, and to indicate to what extent this material might prove of practical value for Ordnance material. Tables, graphs, diagrams, micrographs, and photographs. 364 ref. (Q general, T2, CI)

212-Q. Substitution of Boron for Alloys in Cast Steels. Ray A. Dyke, Jr. and C. K. Donoho. *Transactions of the American Foundrymen's Society*, v. 60, 1952, p. 797-800; disc., p. 800-802.

Use of boron with respect to hardenability, recovery, fading, mechanical properties, and applications. Tables and graphs. (Q general, J26, CI)

213-Q. (French.) **Contribution to the Study of Criteria of Static Strength of Metallic Materials.** Louis Baes. *L'Ossature Métallique*, v. 17, Dec. 1952, p. 602-616.

A discussion of the fundamental diagram of a metal and the transposition of this diagram into Mohr coordinates or into principal normal stresses. Includes diagrams and photographs. (Q23)

214-Q. (German.) **Damping of Bending Vibrations in Thin Sheets by Firmly Adhering Coatings.** Hermann Oberst. *Akustische Beihefte*, no. 4, 1952, p. AB181-AB194.

Bending vibrations of thin sheet metal covered on one side by an adhesive layer of a damping mate-

rial are treated theoretically. Measurements confirm theoretical results. Results of practical importance. Graphs. 6 ref. (Q8)

215-Q. The Alleviation of Thermal Stresses. E. W. Parkes. *Aircraft Engineering*, v. 25, Feb. 1953, p. 51-53.

Investigates dependence of thermal stresses in an aircraft structure upon the degree of insulation and rate of temperature change. Graphs. (Q25)

216-Q. Laterally Loaded Non-Uniform Struts. W. Gittleman. *Aircraft Engineering*, v. 25, Feb. 1953, p. 56-57.

Tabular method for finding bending moments which requires only arithmetical calculation. Tables and diagrams. (Q5)

217-Q. Summary of Progress on Studies of Stress Relaxation in Rail Steel and of Deformational Behavior of Rails. W. S. Hyler and H. J. Grover. *American Railway Engineering Association Bulletin*, v. 54, Feb. 1953, p. 1249-1253.

Investigation aimed toward better understanding of shelling and detailed fractures in rails. Includes studies on stress-relaxation and deformation using low-carbon steel and Ag Cl. (Q25, CN)

218-Q. Stresses Around a Bolt Hole of a Rail With the Joint in Tension. *American Railway Engineering Association Bulletin*, v. 54, Feb. 1953, p. 1254-1261.

Describes investigation. Photographs and tables. (Q25, CN)

219-Q. Wear Phenomena. F. T. Barwell. *Automobile Engineer*, v. 43, Feb. 1953, p. 77-80.

Effects of lubrication and nature of superficial layer. 15 ref. (Q9)

220-Q. Model to Illustrate the Behaviour of Fixed Base Portal Frames in the Plastic Range. M. R. Horne. *British Journal of Applied Physics*, v. 4, Feb. 1953, p. 54-55.

Model described reproduces modes of collapse of a fixed base steel portal frame as predicted by plastic theory. Quantitative agreement is obtained between observed and theoretical loads necessary for collapse. Diagrams. (Q23, ST)

221-Q. Mechanical Properties of Alloy Steels in Investment Castings. S. C. Churchill. *Engineering*, v. 175, Feb. 6, 1953, p. 164-167.

Investigation to analyze stress, tensile strength, and hardness of the castings. Micrographs and tables. (Q27, Q29, CI)

222-Q. Creep Properties of Steels for Power Plants. II. A. E. Johnson and N. E. Frost. *Engineering*, v. 175, Feb. 20, 1953, p. 249-250.

Three methods for computing normal stress and temperature-creep-strain-time curves. Graphs and tables. (Q3, ST)

223-Q. Tensile Properties of Nickel. *Industrial Heating*, v. 20, Feb. 1953, p. 244, 246, 248, 250.

Briefly describes series of tests. (Q27, Ni)

224-Q. A New High Temperature Alloy. M. N. Ornitz and R. H. English. *Iron and Steel Engineer*, v. 30, Feb. 1953, p. 102-112; disc., p. 112-117.

Evidence from field and laboratory tests is presented which demonstrates superiority of NA22H over commonly used commercial heat resistant alloys at temperatures from 1800-2200° F. Mechanical properties are tabulated. Tables, photographs, and graphs. 18 ref.
(Q general, Ni, Cr)

225-Q. The Nature of the Coefficients of Friction. J. T. Burwell and E. Rabinowicz. *Journal of Applied Physics*, v. 24, Feb. 1953, p. 136-139.

Sliding speed was found to influence friction force by the resulting shear strain rate around minute welded junctions. At higher speeds, friction force was also affected by the time required to form a full strength weld. (Q9)

226-Q. Autographic Load-Strain Recorders. A. Binns. *Journal of the Institute of Metals*, v. 81, Feb. 1953, p. 166-168.

Brief general discussion on various types of recorders now in use. (Q27)

227-Q. Specification Creep Testing of Nimonic Gas-Turbine Alloys. C. W. Weaver. *Journal of the Institute of Metals*, v. 81, Feb. 1953, p. 168-172.

Instrument developed to meet demand for short-time creep tests on materials for gas-turbine rotor blading and other high-temperature applications. (Q3, Ni)

228-Q. Crystal Fragmentation in Aluminium During Creep. D. McLean. *Journal of the Institute of Metals*, v. 81, Feb. 1953, p. 287-292.

Seven specimens of super-pure Al having grain sizes of 1 to 9¼ grains per mm., were made to creep at 200° C. under loads varying from about ⅓ to ¾ ton per sq. in.; extensions produced ranged up to 50%. Observations and measurements were made relating to subcrystals formed. Tables. (Q3, N5, Al)

229-Q. Grain-Boundary Slip During Creep of Aluminium. D. McLean. *Journal of the Institute of Metals*, v. 81, Feb. 1953, p. 293-300.

Grain-boundary displacements during creep at 200° C. were measured in seven super-pure Al specimens. Tests covered a range of grain size from 1 to 9¼ grains per sq. mm. and of stress from about ⅓ to about ¾ ton per sq. in. Graphs and micrographs. (Q3, Q24, Al)

230-Q. The Effect of Hydrogen on the Tensile Properties of Steel. J. D. Hobson and J. Hewitt. *Journal of the Iron and Steel Institute*, v. 173, Feb. 1953, p. 131-140.

Influence of microstructure, heat treatment, temperature, and rate of testing on hydrogen embrittlement of steel. Graphs and tables. 13 ref. (Q27, AY)

231-Q. Wear Studies of Irradiated Carbide Cutting Tools. B. Colding and L. G. Erwall. *Nucleonics*, v. 11, Feb. 1953, p. 46-49.

How isotope-tracer measurements, which are more accurate than microscopic examination, show a constant rate of tool wear. Use of Geiger-Muller and autoradiographic methods under normal machining conditions is emphasized. (Q9, C-n)

232-Q. New Stainless Stretches Nickel. Allen G. Gray. *Steel*, v. 132, Mar. 9, 1953, p. 94-97.

Compares new steel containing 1% Ni with Type 301. Strength, corrosion resistance, and fabricating properties. Photographs.
(Q general, R general, SS)

233-Q. Influence of Some Residual Elements and Their Neutralization in Magnesium-Treated Nodular Cast Iron. H. Morrogh. *Transactions of the American Foundrymen's Society*, v. 60, 1952, p. 439-451; disc., p. 451-452.

Previously abstracted from *British Cast Iron Research Association of Research and Development;* item 498-Q, 1952. (Q general, M27, CI)

234-Q. Amsler High-Frequency Torsional Vibrator of 2,000 KG. Type 2,000 HFT 423. *Bulletin de la Réunion des Laboratoires d'Essais et de Recherches sur les Matériaux et les Constructions.* (English Ed.), July 1952, p. 17-21.

Uses, principle, source of current, static tests, device for combined flexure and torsion fatigue tests, photographic recording drum to determine internal damping of materials, and machine data. Photographs and diagram. (Q7, Q8)

235-Q. Creep and Relaxation Limits of Steels at Ordinary Temperature. F. Campus. *Bulletin de la Réunion des Laboratoires d'Essais et de Recherches sur les Matériaux et les Constructions.* (English Ed.), Sept. 1952, p. 39-63.

Nature of test specimens; conditions of preliminary tests; arrangement of creep and relaxation measurements; creep and relaxation limits; and general observations. Graphs and diagrams. (Q3, ST)

236-Q. (Dutch.) **Metals for Use at High Temperatures in Electric Furnaces.** *Smit Mededelingen*, v. 7, Oct.-Dec. 1952, p. 149-154.

Mechanical properties and oxidation resistance of high-temperature steels and alloys. Data are tabulated and charted.
(Q general, R2, T5, SS, Ni, Cr, Si, Al)

237-Q. (Dutch.) **Methods and Apparatus for Control in Research.** A. Ph. Krijff. *Smit Mededelingen*, v. 7, Oct.-Dec. 1952, p. 154-157.

Describes a high-frequency direct-loading fatigue and creep testing apparatus. (Q3, Q7)

238-Q. (French.) **Contribution to the Study of the Strength of Gray Cast Iron.** Albert Collaud. *Von Roll Mitteilungen*, v. 11, July-Dec. 1952, p. 93-104.

A study was made of relationship of structure to dynamic behavior using unnotched bars. It is shown that gray iron can have considerable toughness. (Q23, CI)

239-Q. (German.) **Electron Microscopic Investigation of the Surface of Strained Super Purity Aluminum, I.** Heinz Wilsdorf and Doris Kuhlmann-Wilsdorf. *Zeitschrift für Angewandte Physik*, v. 4, Oct. 1952, p. 361-370.

New method of preparing Al specimens with strains between 0.5 and 64%. This investigation showed a very finely stepped structure outside slip bands for which the designation "elementary structure" was proposed. Development of slip bands is described on basis of electron micrographs and slip-band counts. Micrographs. 13 ref. (Q24, M21, Al)

240-Q. (German.) **Complete Determination of Residual Stresses in Hollow Metallic Cylinders.** H. Bühler and W. Schreiber. *Zeitschrift des Vereines Deutscher Ingenieure*, v. 94, Dec. 11, 1952, p. 1147-1151.

Method by which electric strain gage can be applied to above. Examples of testing brass and steel. Formulas for calculation of residual stress components. Graphs. 19 ref. (Q25, CN, Cu)

241-Q. Influence of Testing Frequency on the Fatigue Strength of Steels and Light Alloys. Th. Wyss. *ASTM Bulletin*, Feb. 1953, p. 31-34.

Fatigue strength for 1 million cycles was determined for different grades of carbon and alloy steel at 350 and 10,500 c.p.m. and for various light alloys at 350 and 8000 c.p.m. Tests were carried out under fluctuating axial tensile stress and zero minimum stress. Short description of equipment used and its influence upon results obtained. Tables. (Q7, CN, AY, Al, Mg)

242-Q. Aluminum Alloy Test Bars. Their Meaning, Production, and Testing. D. L. LaVelle. *Engineering Experiment Station News* (Ohio State University), v. 25, Feb. 1953, p. 19-23, 54-58.

What test bars are; what they do; what they denote; how they should be made, tested, and heat treated; and what to look for in bad bars. Photographs and diagrams. (Q27, Al)

243-Q. Cutting Tool Wear. W. Spaeth. *Industrial Diamond Review*, v. 13, Feb. 1953, p. 39-43.

Life tests of cutting tools can

be used to determine individual properties of materials for workpiece and tools.
(Q9, S21, TS, SG-j)

244-Q. Inelastic Instability and Incremental Theories of Plasticity. E. T. Onat and D. C. Drucker. *Journal of the Aeronautical Sciences,* v. 20, Mar. 1953, p. 181-186.

Shows that incremental plasticity theory leads to proper results when unavoidable initial imperfections of shape are considered. Diagrams and graphs. 11 ref. (Q23)

245-Q. Residual Stresses Introduced During Metal Fabrication. Kent R. van Horn. *Journal of Metals,* v. 5, Mar. 1953; *Transactions of American Institute of Mining and Metallurgical Engineers,* v. 197, 1953, p. 405-422.

Beneficial and injurious effects of these stresses are presented in a qualitative and quantitative manner. Examples from commercial experience illustrate location of residual stresses and practical effects which they introduce. Brass, Al, and steel were used. Photographs and graphs. 38 ref. (Q25, Cu, Al, ST)

246-Q. Directional Properties of 2S Aluminum. K. T. Aust and F. R. Morral. *Journal of Metals,* v. 5, Mar. 1953; *Transactions of American Institute of Mining and Metallurgical Engineers,* v. 197, 1953, p. 431-436.

Preferred orientation and earing characteristics of 2S Al were studied. Empirical correlation was obtained relating earing behavior and mechanical properties for face-centered cubic metals. Strain-ratio measurements for 2S were found to be in agreement with Hill's theory of plastic anisotropy. Photographs and graphs. (Q24, Al)

247-Q. The Fatigue Properties of Z-Section Test Pieces Completely Machined From an Aluminium Alloy Extrusion Conforming to D.T.D. 364B. G. Forrest, K. W. Gunn, and A. R. Woodward. *Journal of the Royal Aeronautical Society,* v. 57, Feb. 1953, p. 103-107.

A detailed account of the testing technique. Diagrams and photographs. (Q7, Al)

248-Q. The Bending of Some Common Beam Sections Into the Plastic Range. Anthony J. Barrett. *Journal of the Royal Aeronautical Society,* v. 57, Feb. 1953, p. 110-115.

Examines problem by using an accurate mathematical form for stress-strain curve, strain and bending moments being expressed as functions of ratios of various properties of material. Value of maximum permissible fiber stress is considered in relation to current requirements for military aircraft stressing. A guide is presented for maximum permissible bending moment in beam cross sections bending about an axis of symmetry. Graphs and diagrams. (Q5)

249-Q. Investigations of the Behaviour of Metal and Plastic Slides. *Machinery* (London), v. 82, Feb. 27, 1953, p. 405-409.

Lubrication of sliding surfaces; tests on cast iron and laminated plastic slideways; "stick-slip" vibration in machine tools; friction of cast iron with different lubricants; properties of polytetrafluorethylene and other plastics; surface finish; and improved lubricants. Graphs. (Q9, CI)

250-Q. How to Make Die Springs Last Longer. *Mainspring,* v. 14, Feb. 1953, unpaged.

Investigates stress conditions under which die springs operate in order to prevent spring failures. Includes formulas for designing rectangular wire springs. (Q25, T7)

251-Q. The Effect of Initial Curvature on the Strength of an Inelastic Column. Thomas W. Wilder, III, William A. Brooks, Jr., and Eldon E. Mathauser. *National Advisory Committee for Aeronautics,* Technical Note 2872, Jan. 1953, 17 pages.

Reduction in column strength due to initial curvature is determined theoretically for a pin-ended, idealized, inelastic H-section column. Equations relating load and lateral deflection permit a systematic variation in parameters representing stress-strain properties, column proportions, and initial curvature of column. Graphs. (Q23)

252-Q. The Effect of Longitudinal Stiffeners Located on One Side of a Plate on the Compressive Buckling Stress of the Plate-Stiffener Combination. Paul Seide. *National Advisory Committee for Aeronautics,* Technical Note 2873, Jan. 1953, 66 pages. (Q28)

253-Q. On Traveling Waves in Beams. Robert W. Leonard and Bernard Budiansky. *National Advisory Committee for Aeronautics,* Technical Note 2874, Jan. 1953, 76 pages.

Basic equations of Timoshenko for motion of vibrating nonuniform beams are presented in several forms, including one in which equations are written in directions of characteristics. Propagation of discontinuities in moment and shear, as governed by these equations, is discussed. Diagrams and graphs. (Q2)

254-Q. Behavior in Pure Bending of a Long Monocoque Beam of Circular-Arc Cross Section. Robert W. Fralich, J. Mayers, and Eric Reissner. *National Advisory Committee for Aeronautics,* Technical Note 2875, Jan. 1953, 33 pages.

Analysis is made of pure bending moment of a thin, infinitely long, pure-monocoque beam having a constant, doubly symmetric, circular-arc cross section. Bending moments, deflections, and stresses are obtained. Analysis shows a nonlinear behavior in bending which leads ultimately to a maximum moment and instability. Diagrams. (Q5)

255-Q. Bearing Strengths of Some 75S-T6 and 14S-T6 Aluminum-Alloy Hand Forgings. E. M. Finley. *National Advisory Committee for Aeronautics,* Technical Note 2883, Jan. 1953, 24 pages.

Investigation to determine bearing and utensile properties in longitudinal and transverse directions. Ratios of bearing to tensile properties were determined. Graphs, diagrams, photographs, and tables. (Q27, Q9, Al)

256-Q. Calculation and Measurement of Normal Modes of Vibration of an Aluminum-Alloy Box Beam With and Without Large Discontinuities. Frank C. Smith and Darnley M. Howard. *National Advisory Committee for Aeronautics,* Technical Note 2884, Jan. 1953, 40 pages.

Lowest normal modes of vibration of three beams were calculated using a matrix iteration method. Experimental and calculated data are compared. Experimental measurements were limited at higher frequencies by local vibrations of small elements of beams. Graphs and tables. (Q23, Al)

257-Q. On the Statistical Interpretation of Fatigue Tests. A. M. Freudenthal and E. J. Gumbel. *Proceedings of the Royal Society,* v. 216, ser. A, Feb. 10, 1953, p. 309-332.

Statistical theory of extreme values can be applied to interpretation of observed frequencies of survival at any stress amplitude. Graphs and tables. 20 ref. (Q7)

258-Q. Structural Changes During the Fatigue of Metals. F. P. Bullen, A. K. Head, and W. A. Wood. *Proceedings of the Royal Society,* v. 216, ser. A, Feb. 10, 1953, p. 332-343.

X-ray diffraction and metallographic examinations of a metal subjected to cyclic stressing. Micrographs. 15 ref. (Q7)

259-Q. Three Years' Experience With a New Micro-Abrasion Tester. P. Grodzinski. *Research,* v. 6, Mar. 1953, p. 98-105.

Experiences gained from abrasion tester designed to determine wear over a small volume of specimen. Graphs, diagrams, and photographs. 17 ref. (Q9)

260-Q. (French.) Relation Between the Fatigue and Plastic Deformation of Steels. A. Fotiadi. *Métaux Corrosion-Industries,* Nov. 1952, p. 425-445.

Reactions of quenched and tempered steels to external forces. Simple phase (ferritic or austenitic) and aggregate structures were used. Diagrams. (Q7, Q24, SS)

261-Q. (French.) Structural Changes of Aluminum During Creep. G. Wyon and C. Crussard. *Métaux Corrosion-Industries,* Nov. 1952, p. 446-457.

Experimental data and results. Micrographs. 14 ref. (Q3, Al)

262-Q. (French.) Influence of Addition Elements on the High Temperature Behavior of Magnesium Alloys. Jean Gris. *Métaux Corrosion-Industries,* Nov. 1952, p. 458-462.

Effects on cast and wrought alloys. Properties are compared. Tables, graphs, and charts.
(Q general, Mg)

263-Q. (Spanish.) Collaboration of the Shipyards in the Study of Steel Brittleness. Antonio Villanueva Nunez. *Ciencia y Tecnica de la Soldadura,* v. 11, Sept.-Oct. 1952, 14 pages.

Anisotropy of rolled steel in impact tests, welding of aging steels, and the Schnadt test in selection of steel for welded ships. Tables and diagrams. (Q23, K9, CN)

264-Q. (Book.) Studies in Elastic Structures. A. J. S. Pippard. 361 pages. 1952. Edward Arnold, 41 Maddox St., London W.1, England. 60s.

Stresses in circular rings, wheels, braced rings, rotating wheels, interconnected bridge girders, multiple lattice frames, cable bracing, restrained pipe lines, and braced tube. Analysis of open panel structures, bow girders, and transversely loaded frames are included. (Q21)

R

CORROSION

97-R. Our Experience With Corrosion. *Chemical Engineering,* v. 60, Mar. 1953, p. 344, 346-348.

Problems of pipelines, valves, leadlined equipment, paints, and keeping equipment clean. (R5, T29)

98-R. Corrosion Problems in Steam-Jet Vacuum Equipment. David H. Jackson. *Chemical Engineering Progress,* v. 49, Feb. 1953, p. 102-104.

Accelerated corrosion caused by high velocities in nozzle heads. Qualifications of materials used. Diagrams. (R4)

99-R. Corrosion of Iron and Steel by Aqueous Suspensions of Sulphur. T. W. Farrer and F. Wormwell. *Chemistry & Industry,* Jan. 31, 1953, p. 106-107.

Investigates possibility that elementary sulfur stimulates corrosion of iron and steel. 7 ref. (R6, ST)

100-R. The Oxidation of Ferrous Hydroxide. J. E. O. Mayne. *Journal of the Chemical Society,* Jan. 1953, p. 129-132.

Air-dried material produced by addition of alkalis to ferrous sulphate solution was examined. Results are explained in terms of oxidation and hydrolysis of a basic sulfate in relation to corrosion of ferrous metals. (R5, Fe)

101-R. Corrosion Tests on Bare and Clad Magnesium Sheet. B. J. Nelson. *Modern Metals,* v. 9, Feb. 1953, p. 63-65.

High-strength Mg alloy sheet can be clad with a protective layer of corrosion resistant alloy. Under corrosive conditions cladding serves as a sacrificial protection for core material. Micrographs and tables. (R11, L22, Mg)

102-R. How Inhibitors Prevent Corrosion in Oil Wells. Part 3. Thomas M. Newell. *Oil and Gas Journal,* v. 51, Feb. 23, 1953, p. 207.

Experiments using steel plates and inhibitors. Properties of efficient inhibitors. (R10, ST)

103-R. Corrosion. An Engineering Problem. Marshall E. Parker. *Petroleum Engineer,* v. 25, Feb. 1953, p. D3-D14.

Emphasizes need of properly trained engineers for designing and applying principles of corrosion to equipment. (R general, A3)

104-R. Your Corrosion Engineer. F. L. Laque. *Petroleum Processing,* v. 8, Feb. 1953, p. 230-233.

Factors for evaluating a corrosion engineer with respect to his attributes, duties, and results. (R general, A6)

105-R. The Corrosion of Iron and Steel and Its Prevention. J. C. Hudson. *Times Science Review,* Spring 1953, p. 14-15.

Mechanism, causes, and protective coatings. Graphs and photographs. 14 ref. (R general, ST)

106-R. (French.) **Considerations on the Passivity of Metals.** R. Piontelli. *Proceedings of the Third Meeting, Berne* 1951, International Committee of Electrochemical Thermodynamics and Kinetics, p. 51-89; disc., p. 89-92.

Defines various states of passivity and emphasizes correlation to nature of a metal. Theoretical discussion is included. 31 ref. (R10)

107-R. (French.) **Passivation and Activation Potentials of Iron, Cathodic Corrosion of Iron in the Presence of Oxygen.** M. Pourbaix and J. Feron. *Proceedings of the Third Meeting, Berne* 1951, International Committee of Electrochemical Thermodynamics and Kinetics, p. 128-133; disc., p. 133-134.

Anodic and cathodic polarization curves for Fe determined in presence of 0.1 M aqueous solution of $NaHCO_3$ (pH=8.4), free of O_2, and saturated in O_2 under 0.2 atm., respectively. Graphs. (R10, P15, Fe)

108-R. (French.) **Passivation of Iron in the Presence of Chloride.** M. Pourbaix and J. Feron. *Proceedings of the Third Meeting, Berne* 1951, International Committee of Electrochemical Thermodynamics and Kinetics, p. 134-139; disc., p. 139-140.

Anodic and cathodic polarization curves for Fe, determined in presence of 0.1M aqueous solutions of $NaHCO_3$ (pH=8.4) free of NaCl, and with varying amounts of NaCl, respectively. Graphs. (R10, P15, Fe)

109-R. (French.) **Observations on the Polarization Curves of Stainless Steels in a Strong Acid Medium.** J. M. Defranoux. *Proceedings of the Third Meeting, Berne* 1951, International Committee of Electrochemical Thermodynamics and Kinetics, p. 141-145; disc., p. 145.

A study of 18-8 steel (2.5% Mo) in an H_2SO_4 medium. 7 ref. (R5, S)

110-R. (French.) **Remarks on the Anodic Oxidation of Chromium in Alkaline Solution.** Jean Besson. *Proceedings of the Third Meeting, Berne* 1951, International Committee of Electrochemical Thermodynamics and Kinetics, p. 155-159; disc., p. 159-160.

Studies the above transformation using ferrochromium with 60-65% Cr. (R1, Fe, Cr)

111-R. (French.) **The Chemical Passivation of Metals.** L. Meunier. *Proceedings of the Third Meeting, Berne* 1951, International Committee of Electrochemical Thermodynamics and Kinetics, p. 204-212; disc., p. 213.

The behavior of Ag, Cd, Ni, and Co in an HCl-H_2CrO_3 compound. Diagrams. 13 ref. (R10, Ag, Cd, Ni, Co)

112-R. (French.) **Corrosion and Protection of Metals. Immunity, Passivation, Passivity.** M. Pourbaix. *Proceedings of the Third Meeting, Berne* 1951, International Committee of Electrochemical Thermodynamics and Kinetics, p. 464-471.

Discusses the above terms and gives diagrams illustrating these phenomena in metals. (R10, Zn, Fe, Pb, Ag, Cu)

113-R. (German.) **Passivity of Iron in Acid Solutions.** K. F. Bonhoeffer. *Proceedings of the Third Meeting, Berne* 1951, International Committee of Electrochemical Thermodynamics and Kinetics, p. 47-49; disc., p. 49-50.

Difference between new and previously passivated Fe. Analogy between stimulation of nerves and cathodic activation of passive Fe, as illustrated by travel of the activation wave on a passive iron wire. (R10, Fe)

114-R. (German.) **Corrosion Phenomena on Cadmium in Sodium Chloride Solutions and Their Interpretation on the Basis of the Potential-pH Diagram of Cadmium.** W. Feitknecht and E. Wyler. *Proceedings of the Third Meeting, Berne 1951,* International Committee of Electrochemical Thermodynamics and Kinetics, p. 102-116; disc., p. 116.

Interaction of electrochemical properties of the metal; chemical and thermodynamic properties of products of corrosion; and displacement of ions in solution, especially on the metallic surface. Diagrams and micrographs. 14 ref. (R5, P15, Cd)

115-R. (German.) **The Structure of Anodically Produced Hydroxide Layers in Cadmium.** K. Huber. *Proceedings of the Third Meeting, Berne 1951,* International Committee of Electrochemical Thermodynamics and Kinetics, p. 117-121; disc., p. 121-122.

Experimental data on determination of structure and chemistry of OH-layers producing metallic passivation. Micrographs. (R10, Cd)

116-R. Bacterial Attack on Buried Piping Regarded as Serious Cause of Rapid Corrosion. Carl G. Deuber. *American Gas Journal,* v. 178, Feb. 1953, p. 31, 35.

Corrosive deterioration caused by bacterial action. (R1, CI)

117-R. Scale Formation in Sea-Water Distilling Plants. H. Hillier. *Engineer,* v. 195, Feb. 6, 1953, p. 208-209; Feb. 13, p. 255-256.

Typical performance of an evaporating plant and a test plant with testing procedures and results. Part 2: Treatment of $CaCO_3$ scale with HCl, H_2SO_4, $NaHSO_4$, $FeCl_3$, organic dispersives, and phosphate compounds. Graphs. (R4)

118-R. Caustic Cracking in Marine Scotch Boilers. W. McClimont. *Engineering,* v. 175, Feb. 13, 1953, p. 219-220.

Intercrystalline fractures which occur in boiler components under influence of static stress concentrations and in contact with fairly concentrated solutions of NaOH. 28 ref. (R2, R5)

119-R. The Attack of Metals by Free Radicals and Atoms. F. W. Thompson and A. R. Ubbelohde. *Journal of Applied Chemistry,* v. 3, Jan. 1953, p. 27-36.

Discusses a number of examples in terms of thermodynamics, kinetics, and other cases due to transient concentrations of atoms and free radicals. 53 ref. (R1)

120-R. Atmospheric Corrosion and Stress-Corrosion of Aluminium-Magnesium-Silicon Alloys in the Fully Heat-Treated Condition. G. J. Metcalfe. *Journal of the Institute of Metals,* v. 81, Feb. 1953, p. 269-278.

Corrosion behavior of Al alloys H10-WP and H15-WP in extruded form. Stressed and unstressed specimens were tested by exposure to sea water, river water, and various natural atmospheres. Attack was assessed by visual and microscopical examination and by tensile tests on corroded material. Average tensile test results obtained at intervals during 2-year exposure are summarized in graphs and tables. (R3, R4, Al)

121-R. Intercrystalline Corrosion in Cast Zinc-Aluminium Alloys. C. W. Roberts. *Journal of the Institute of Metals,* v. 81, Feb. 1953, p. 301-309.

Susceptibility to corrosion in an air-water-vapor atmosphere at 95° C., and effects of minor elements. Tentative theories are proposed. (R2, Zn, Al)

122-R. Transgranular Stress Corrosion in Chromium-Nickel Stainless Steels. C. Edeleanu. *Journal of the Iron and Steel Institute,* v. 173, Feb. 1953, p. 140-146.

Corrosion may be due to preferential attack on small quantities of quasi-martensite which form in this type of steel on straining. Several methods for reduction of corrosion. Tables, photographs, and micrographs. 23 ref. (R1, SS)

123-R. Boiler Tube Corrosion. A. M. Hall and J. H. Jackson. *Machinery Lloyd* (Overseas Ed.), v. 25, Jan. 31, 1953, p. 68-73, 75, 77, 79, 81.

Research conducted at Battelle Memorial Institute for studying abnormal tube corrosion in a Hg boiler. Experimental procedure. (R4, AY)

124-R. Accelerated Corrosion Test of Stainless Steel Samples in an Effort to Establish Galvanic Attack. J. T. Waber and S. F. Waber. *Metal Progress,* v. 63, Jan. 1953, p. 204, 206, 208. (Condensed by J. T. Waber from Document LA1302, Los Alamos Scientific Laboratory, Nov. 14, 1951.)

Tests to determine whether galvanic corrosion occurs when Type 316 ELC stainless steel plates are welded with Type 347 rod and exposed to halogenous acid fumes. (R11, SS)

125-R. Structure and Corrosion. G. V. Akimov. *Metal Progress,* v. 63, Jan. 1953, p. 230, 232. (Translated and condensed by A. G. Guy.)

Previously abstracted from original. *Izvestiya Akademii Nauk SSSR, Otdelenie Khimicheskikh.* See item 244-R, 1952. (R general, M27)

126-R. Screening Stainless Steels From the 240-Hr. Nitric Acid Test by Electrolytic Etching in Oxalic Acid. Michael A. Streicher. *ASTM Bulletin,* Feb. 1953, p. 35-38.

Certain characteristics of HNO_3 test necessary for an understanding of relation between the two tests are described. Previously used electrolytic etching methods are reviewed. Micrographs. 8 ref. (R11, SS)

127-R. Caustic Cracking in Steam Boilers. The Intercrystalline Corrosion of Mild Steels. R. N. Parkins. *Chemistry & Industry,* Feb. 28, 1953, p. 180-184.

Theories of intercrystalline corrosion including H_2, precipitation,

oxide film, mechanical, and boundary distortion. Prevention of caustic cracking. 52 ref. (R2, CN)

128-R. Liquid Metal Corrosion. Anton de S. Brasunas. *Corrosion,* v. 9, Mar. 1953, p. 78-84.

Nature and extent of interaction between a variety of high and low melting metals. Ti, Ni, Be, Na, V, Ni-Cr alloy, and stainless steels were used in investigations. Micrographs. (R6, Ti, Ni, Be, Na, V, Cr, SS)

129-R. Views on the Mechanism of Pitting Corrosion of Aluminum. P. M. Aziz. *Corrosion,* v. 9, Mar. 1953, p. 85-90.

Thermodynamic calculations were carried out to determine possible corrosion reactions of Al in neutral and near-neutral aqueous solutions. Quantitative electrochemical factors determinating corrosion rate, and qualitative mechanism for initiation and propagation of a corrosion pit in Al. (R2, Al)

130-R. Radiometric Study of the Adsorption Characteristics of Stearic Acid. Stanley L. Eisler. *Corrosion,* v. 9, Mar. 1953, p. 91-94.

Work which establishes feasibility of using radiometric techniques for determining adsorption of polar organic compounds on steel surfaces. Tables. (R11, ST)

131-R. The Present Status of Bacterial Corrosion Investigations in the United States. Carl G. Deuber. *Corrosion,* v. 9, Mar. 1953, p. 95-99.

Characteristics of anaerobic sites; and detection, prevention, and mechanism of bacterial corrosion. 42 ref. (R1)

132-R. Aluminum for Copper. Greater Corrosion Risks? H. A. Liebhafsky and E. W. Balis. *General Electric Review,* v. 56, Mar. 1953, p. 12-16, 61.

Thermodynamic stability of Al, with respect to corrosion. Micrographs and diagrams. (R1, Al)

133-R. Corrosion Tests in Diamond Drill Crown Recovery Operations. K. G. A. Strachen. *Industrial Diamond Review,* v. 13, Feb. 1953, p. 43.

Tests were made on 14 metals and alloys exposed for 150 days to the fumes of HCl, H_2SO_4, and HNO_3 acids. (R5)

134-R. Correlations Between Parabolic Oxidation of Metals and Properties of Oxides. Andrew Dravnieks. *Journal of the Electrochemical Society,* v. 100, Mar. 1953, p. 95-102.

Demonstrates that empirical parabolic oxidation constants integrate into comparatively coherent trends. These trends may be explained on basis of concepts issuing from present knowledge of diffusion in solids. Graphs. 126 ref. (R2, N1)

135-R. Stress-Corrosion Cracking of Commercially Pure Titanium. George C. Kiefer and Warren W. Harple. *Metal Progress,* v. 63, Feb. 1953, p. 74-76.

Tests using chemical solutions to determine extent of cracking. Photographs and micrographs. (R1, Ti)

136-R. The Oxidation of Iron Around 200° C. W. H. J. Vernon, E. A. Calnan, C. J. B. Clews, and T. J. Nurse. *Proceedings of the Royal Society,* v. 216, ser. A, Feb. 10, 1953, p. 375-397.

Phenomena associated with a critical temperature at about 200° C. in oxidation of mild steel sheet in air were investigated by gravimetric, microchemical, and electron-diffraction methods. Graphs and tables. 29 ref (R2, CN)

137-R. Prevention of Rust. Herbert H. Uhlig. *Technology Review,* v. 55, Mar. 1953, p. 251-254, 288, 290.

History, mechanism, and application of cathodic protection. (R10, CN)

138-R. (German.) Corrosion of Passive Iron in Sulfuric Acid. U. F. Franck and K. Weil. *Zeitschrift für Elektrochemie Berichte der Bunsengesellschaft für Physikalische Chemie,* v. 56, no. 8, 1952, p. 814-822.

Simultaneous measurement of corrosion and current voltages at passive Fe electrodes in dilute H_2SO_4, were used to show that current density and corrosion reach equilibrium and are independent of potential. 16 ref. (R5, R1)

139-R. (Book.) Corrosion of Buried Metals: A Symposium. 153 pages. July 1952. Iron and Steel Institute, 4 Grosvenor Gardens, London S.W.1, England. 15s.

Consists of Special Report No. 45, which contains text of papers presented at symposium together with discussion on corrosion of buried metals. (R8)

S

INSPECTION AND CONTROL

70-S. Non-Destructive Testing Reveals Casting Defects. J. M. Anspach. *American Machinist,* v. 97, Mar. 2, 1953, p. 117-124.

Use of each method and relative cost. Photographs and diagrams. (S13)

71-S. Spark Testing of Tool Steels. J. Lomas. *British Steelmaker,* v. 19, Feb. 1953, p. 86-89.

Method of sorting toolsteels. Primarily used for steels of different chemical compositions. (S10, TS)

72-S. Open-Hearth Bath Temperature Measurement. F. S. Swaney. *Instruments,* v. 26, Feb. 1953, p. 256-258, 288, 290.

Development of a light easily assembled thermocouple for open-hearth use. Operational results. Diagrams and photographs. (S16, D2)

73-S. New Detector Locates Tramp Metal in Iron Ore. W. H. Schwedes and C. W. Clapp. *Iron Age,* v. 171, Feb. 26, 1953, p. 140-141.

Detector can distinguish differences in structure between tramp metal and ore regardless of magnetic properties. Diagrams. (S10)

74-S. Ultrasonic Examinations of Weldments and the Establishment of Safe Acceptable Limits for Defects. Frank C. Parker. *Nondestructive Testing,* v. 11, Jan. 1953, p. 12-20.

Incipient cracks and defects which may become interconnected during operation because of shock, vibration, or thermal changes; and those not apparent by radiography but which may be detected through ultrasonic examination. Micrographs and photographs. (S13)

75-S. Quality Control Applications of Nondestructive Tests in the Airframe Industries Which Will Effectively Lower Production Costs. B. W. Clawson. *Nondestructive Testing,* v. 11, Jan. 1953, p. 25-27.

Nondestructive testing as it is currently being utilized and expanded within a specific airframe manufacturing installation. (S13)

76-S. Ultrasonic Testing of Cast Iron Pipe. G. B. Baumeister. *Nondestructive Testing,* v. 11, Jan. 1953, p. 28-29.

General discussion of inspection methods. Photographs. (S13, CI)

77-S. Commercial Interpretation of Magnetic Particle Tests Correlated With Radiography and Physical Tests. A. F. Cota and J. J. Chyle. *Nondestructive Testing,* v. 11, Jan. 1953, p. 34-40.

Testing program includes inspection by means of radiographic, magnetic particle, penetrant, ultrasonic, hydrostatic, ionization, thermal, and visual methods to anticipate permissible loading of the product. The tests and equipment used. Photographs and diagrams. (S13)

78-S. The Whys and Wherefores of Statistical Quality Control. Wade R. Weaver. *Transactions of the American Foundrymen's Society,* v. 60, 1952, p. 462-465.

Fundamental reasons why any industry, and foundry industry in particular, can and should avail itself of potential advantages offered by quality control. (S12)

79-S. Foundry Management Looks at Statistical Quality Control. E. L. Fay. *Transactions of the American Foundrymen's Society,* v. 60, 1952, p. 511-516.

The value to foundry manager in controlling and increasing quality, in reduction of scrap and salvage costs, and in indirect and secondary benefits to be derived. Several fundamental steps in setting up a successful quality control program, and some of its results. Photographs and graphs. (S12, E general)

80-S. Quality Control Program for a Steel Jobbing Foundry. H. H. Fairfield. *Transactions of the American Foundrymen's Society,* v. 60, 1952, p. 536-538.

Brief description. Photographs and tables. (S12, E general, CI)

81-S. Quality Control in a Malleable Iron Foundry. E. F. Price and O. K. Hunsaker. *Transactions of the American Foundrymen's Society,* v. 60, 1952, p. 655-664; disc., p. 664-665.

Principles of quality control, control of raw materials, melting control, coremaking, molding operations, annealing control, soft iron control, and finishing department control. Graphs. (S12, E general, CI)

82-S. A Solidification Dilatometer and Its Application to Gray Iron. R. P. Dunphy and W. S. Pellini. *Transactions of the American Foundrymen's Society,* v. 60, 1952, p. 783-788; disc., p. 788.

Features of solidification, metal movement, and dimensional changes of simple systems. Diagrams and graphs. (S16, P10, CI)

83-S. Report of Committee 4 on Rail. C. J. Code, chairman. *American Railway Engineering Association Bulletin,* v. 54, Feb. 1953, p. 1175-1264.

Consists of 12 papers relating to failure and defects of rails. (S21, CN)

84-S. Investigation of Failures in Control-Cooled Railroad Rails. R. E. Cramer. *American Railway Engineering Association Bulletin,* v. 54, Feb. 1953, p. 1186-1193.

Examples of various rail failures and their analysis at University of Illinois. Macro and micrographs. (S21, CN)

85-S. Rail Failure Statistics, Covering (a) All Failures; (b) Transverse Fissures; (c) Performance of Control-Cooled Rail. C. J. Code, chairman. *American Railway Engineering Association Bulletin,* v. 54, Feb. 1953, p. 1194-1211.

Extensive tabulated information. (S21, CN)

86-S. Service Tests of Various Types of Joint Bars. T. A. Blair, chairman. *American Railway Engineering Association Bulletin,* v. 54, Feb. 1953, p. 1213-1221.

Graphical interpretation. (S21, CN)

87-S. Eleventh Progress Report of the Rolling-Load Tests of Joint Bars. R. S. Jensen. *American Railway Engineering Association Bulletin,* v. 54, Feb. 1953, p. 1223-1237.

Testing machines, test specimens, results of rolling-load tests, hardness tests on joint bars, and rolling-load tests of oil-quenched and tempered bars. Data from 85 bars that failed in service are given. Photographs, micrographs, and tables. (S21, Q26, CN)

88-S. Service Tests on the Burlington Railroad Near Fort Morgan, Colo.,

of Joint Bars of Different Metallurgies. *American Railway Engineering Association Bulletin*, v. 54, Feb. 1953, p. 1237-1239.
(S21, CN)

89-S. Eleventh Progress Report on Shelly Rail Studies at the University of Illinois. R. E. Cramer. *American Railway Engineering Association Bulletin*, v. 54, Feb. 1953, p. 1243-1249.
Repeat test on heat treated rail, completion of tests of flame hardened rails, rolling-load tests of commercially flame-hardened rails, rolling-load tests to develop detail fractures, and stress relief of specimen during rolling-load tests. Tables and photographs. (S21, Q26, CN)

90-S. Standard Specifications for Leaded Nickel-Brass (Leaded Nickel-Silver) and Leaded Nickel-Bronze (Leaded Nickel-Silver) Sand Castings. *Foundry*, v. 81, Mar. 1953, p. 219-220.
Tabulated information of ASTM Designation. B 149-52. (S22, E11, Cu)

91-S. Effect of Lubricant on Gear Performance. V. N. Borsoff and S. S. Sorem. *Iron and Steel Engineer*, v. 30, Feb. 1953, p. 83-88; disc., p. 88.
Gear failures; mechanical methods and lubrication as factors in improving gear performance; research with radioactive tracers. Micrographs and graphs. 12 ref. (S21, Q9, S19)

92-S. American Standard Specifications for Cast Iron Pipe Centrifugally Cast in Metal Molds, for Water or Other Liquids. *Journal American Water Works Association*, v. 45, Feb. 1953, p. 189-206.
Consists of ASA specifications A21.6-1953 (AWWA C106-53). Extensive tables. (S22, E14, CI)

93-S. American Standard Specifications for Cast Iron Pipe Centrifugally Cast in Sand-Lined Molds, for Water or Other Liquids. *Journal American Water Works Association*, v. 45, Feb. 1953, p. 207-230.
Consists of ASA specifications A21.8-1953 (AWWA C108-53) Tables and diagrams. (S22, E14, CI)

94-S. Some Methods of Measuring Surface Topography as Applied to Stretcher-Strain Markings on Metal Sheet. W. H. L. Hooper. *Journal of the Institute of Metals*, v. 81, Feb. 1953, p. 161-165.
Two techniques for measuring surface topography of sheet metal showing strain markings. Talysurf surface-measuring instrument, and light-interference effects are used. Macrographs. (S15, CN, Al)

95-S. (German.) **Sampling Certain Lead and Zinc-Containing Materials.** Fritz Ensslin. *Zeitschrift für Erzbergbau und Metallhüttenwesen*, v. 5, Dec. 1952, p. 475-479.
Tested procedures for taking samples of various materials including Pb and Pb alloys; accumulator residues and Pb ashes; Pb blast furnace slags; metallic Zn and Zn alloys; Zn scrap and ash; and ammoniac slags. Diagrams. (S12, Pb, Zn)

96-S. (German.) **Surface Testing With Micro-Interferences. A New Surface Interferometer.** Rudolf Landwehr. *Zeitschrift für Angewandte Physik*, v. 4, Oct. 1952, p. 377-386.
Describes and diagrams apparatus. Reflecting and control surfaces are extended and moved under a microscope along with the specimen. Examples of application. 31 ref. (S15)

97-S. (Japanese.) **Ultrasonic Method for Nondestructive Inspection.** Noboru Takagi and Noboru Niwa. *Journal of N.D.I.*, v. 1, Autumn, 1952, p. 13-16.
Classifies various methods and briefly describes an ultrasonic detector. (S13)

98-S. (Japanese.) **The Present Situation of X-Ray Inspection Units in Japan.** Yoshio Komai. *Journal of N.D.I.*, v. 1, Autumn, 1952, p. 24-28.
Classifies and describes high-voltage circuit systems of units. Emphasizes improvements made on self-rectifying system. Diagrams. (S13)

99-S. Sonic Energy. Industry's New Production and Inspection Tool. Carroll W. Boyce. *Factory Management and Maintenance*, v. 111, Mar. 1953, p. 84-95.
How sonic energy can inspect, clean, measure, precipitate, and emulsify. Defines sonic energy and describes equipment for its production. Photographs. (S13, S14, L10)

100-S. Magnetic Particle Production Inspection. Gilbert C. Close. *Finish*, v. 10, Mar. 1953, p. 32-33, 37, 96.
Stresses importance of inspection standards and describes procedures. Photographs. (S13)

101-S. Standard Commercial Wrought Tin and Aluminum Brasses, Bronzes, and Nickel Silvers. Arthur H. Allen. *Metal Progress*, v. 63, Feb. 1953, p. 96-B.
Extensive table including composition, forms that can be ordered, range of mechanical properties, fabrication processes, and fabricating properties. (S22, Cu)

102-S. Various Methods of High Pressure Testing Oil Country Tubular Material. H. G. Texter. *Petroleum Engineer*, v. 25, Mar. 1953, p. B45-B48, B50-B51, B53-B54, B56-B58.
Advantages and disadvantages of field testing and testing at the mill. Various methods of sealing for mill testing. Photographs. (S21)

103-S. Statistical Quality Control in the Finishing Industry. Bryant W. Pocock. *Products Finishing*, v. 17, Mar. 1953, p. 22-32, 34.
Practical applications for controlling products. (S12, L general)

104-S. Conversion Table for the Most Frequently Used Sheet and Wire Gauges. *Pro-Metal*, Dec. 1952, p. 94-95.
Includes Standard (SWG); Birmingham (BG); American (AWG); U. S. Gov't. Standard; Stub's (BWG); Washburn & Moen (SWG); London/Old English; Manufacturers' for Sheet Steel; and Silesian (Galvanized). (S14)

T APPLICATIONS OF METALS IN EQUIPMENT

74-T. New Fabricating Materials From Rubber and Copper-Clad Aluminum. *Canadian Chemical Processing*, v. 37, Feb. 1953, p. 54.
Cladding process, applications, use of bonding agents, and method of fabricating. (T29, L26, L22, Al, Cu)

75-T. Some Metallurgical Problems Imposed by Stratospheric Flight. P. L. Teed. *Journal of the Birmingham Metallurgical Society*, v. 32, Dec. 1952, p. 130-162.
Outlines foreseeable problems. Includes photographs, tables, and graphs. (T24)

76-T. Automotive Service Experience With Magnesium. F. H. Mason. *Modern Metals*, v. 9, Feb. 1953, p. 34, 36.
Corrosion experience; stress and fatigue; and machining factors. Photographs. (T21, Mg)

77-T. Ductile Cast Iron. Where Can It Be Used in Process Equipment? *Petroleum Processing*, v. 8, Feb. 1953, p. 234-235.
Possible uses in petroleum processing industry. (T29, CI)

78-T. (German.) **Advances in Materials for the Chemical Industry.** Luigi Piatti. *Chimia*, v. 7, Jan. 15, 1953, p. 3-11.
Advances made in cast iron, steels, heat resistant materials, stainless steels, plated steels, nickel, nickel alloys, nonferrous metals, newer metals, organic materials, graphite, carbons, enamels, glass, and ceramic wares. 160 refs.
(T29, CI, ST, Ni, EG-a)

79-T. (Italian.) **Collapsible Aluminum Tubes.** F. Emanuele. *Alluminio*, v. 21, Dec. 1952, p. 608-614.
Fabrication, characteristics, protection, and control of flexible Al tubes, with particular regard to its use for canning concentrated tomato puree. (T29, Al)

80-T. Nailing Down Their Market. *Business Week*, Feb. 21, 1953, p. 44, 46, 48.
Recent advances in Al nail industry. (T10, Al)

81-T. Aluminum in Electrical Applications. Where and How It Should Be Used. R. M. Leedy and S. A. Rosecrans. *Materials & Methods*, v. 37, Feb. 1953, p. 89-91.
Electrical conductivity, thermal expansion, joining, corrosion, and applications. (T1, P15, Al)

82-T. Which Metal Form for Jet Engine Blades? John L. Everhart. *Materials & Methods*, v. 37, Feb. 1953, p. 92-96.
Production of blades by forging, casting, machining, powder metallurgy, grinding, fabrication from sheet, deep drawing, rolling, and extrusion. Shows which alloys are applicable to the processes. Photographs and tables.
(T25, E general, F22, F23, G general, H general, SS, Ni, Co)

83-T. (English.) **The Use of Special Steels for Gears.** *Aciers Fins et Spéciaux Francais*, Dec. 1952, p. 27-30.
Types of alloy steels used in France for making gears. Heat treatments. (T7, J general, AY)

84-T. (English.) **Metallurgical Aspects of the Manufacture of Drilling Equipment.** *Aciers Fins et Spéciaux Francais*, Dec. 1952, p. 70-74.
Selection of steel for drilling tools and auxiliary equipment. (T6, AY)

85-T. (French.) **Contribution to the Study of "Rollodur' Steel for Tools of High Cutting Capacity.** Albert Collaud. *Von Roll Mitteilungen*, v. 11, July-Dec. 1952, p. 73-91.
Use of high-Cr toolsteel in place of 18-4-1 steel for high speed tools. Properties gained by heat treatment and castability. (T6, TS)

86-T. Strategic Metals in Aircraft Construction. R. Smallman-Tew. *Canadian Metals*, v. 16, Feb. 1953, p. 18, 20, 22.
Materials used in aircraft construction with emphasis on scarce items. Considers steel, light metals, and alloying components.
(T24, ST, Al, Mg)

87-T. Metallurgy for Nuclear Reactors. J. E. Burke. *General Electric Review*, v. 56, Mar. 1953, p. 6-9.
Shows that metallurgists must deal with strength, formability, thermal conductivity, and corrosion at high temperatures when selecting materials for nuclear reactors. Cost, availability, and interaction with neutrons must also be considered. Tables and diagrams. (T25)

88-T. How and Where to Use 430 Stainless. R. A. Lincoln and T. A. Pruger. *Iron Age*, v. 171, Feb. 26, 1953, p. 127-131; Mar. 5, 1953, p. 178-181.
Substitution problems and how to solve them. Photographs and tables. (T general, SS)

89-T. Nodular Iron Tackles Big Jobs. T. E. Eagan. *Steel*, v. 132, Mar. 16, 1953, p. 102-104.
Evaluates performance of ductile iron castings under actual service conditions. Photographs.
(T general, CI)

90-T. (Book—German.) **(Tires, Hubs and Solid Wheels.) Radreifen, Rad-**

scheiben, und Vollräder. O. H. Lehmann. 94 pages. 1952. Verlag Stahleisen, Düsseldorf, Germany. 14.50 DM.

Production of wheels for railroads from the ingot to testing the finished product. Forging and rolling of tires, hubs and solid tires. A few pages deal with heat treatment and furnaces (continuous furnaces in Germany are successfully side-fired). Almost all the processes described can be applied to American railroad wheels and tires. (T23, F22, F23, ST)

V

MATERIALS
General Coverage of Specific Materials

35-V. New Magnesium-Zirconium Casting Alloy. R. J. M. Payne, A. D. Michael, and R. W. Eade. *Magnesium Review and Abstracts,* v. 8, Dec. 1952, p. 173-176.

How Mg-Zn-rare earth-Zr casting alloy was evolved to meet special requirements. Graphs. (Mg)

36-V. Zirconium As a Coming Metal. *Mining Journal,* v. 240, Feb. 6, 1953, p. 157-159.

Properties, applications, production, and refining problems. (Zr)

37-V. Tonnage Titanium Production. C. I. Bradford and W. L. Finlay. *Modern Metals,* v. 9, Feb. 1953, p. 68-71.

Reasons for growth of production and progress in technological matters. Graphs and photographs. (Ti)

(Continued on p. 45)

HERE'S HOW . . .

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METALS REVIEW

7301 Euclid Avenue **Cleveland 3, Ohio**

President and Past Chairmen Honored at Texas

The North Texas Chapter Honored R. L. Wilson, National President, and Past Chairmen at the January Meeting. Mr. Wilson spoke on "Current Developments in Alloy Constructional Steels". Pictured are, top, from left: A. Willis; B. Dominy, treasurer; A. Newman; J. M. Thompson, Jr.; M. J. Parker, representing L. L. Sanders; R. A. Peterson; and seated, from left; J. M. Turbitt, secretary; F. E. Stanley, chairman; Mr. Wilson; K. Delaplaine, vice chairman; and C. F. Dominy. Unless otherwise noted, all are past chairmen.

EMPLOYMENT SERVICE BUREAU

The Employment Service Bureau is operated as a service to members of the American Society for Metals and no charge is made for advertising insertions. The "Positions Wanted" column, however, is restricted to members in good standing of the A.S.M. Ads are limited to 50 words and only one insertion of any one ad. Address answers care of A.S.M., 7301 Euclid Ave., Cleveland 3, O., unless otherwise stated.

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METALLURGIST: Cold rolled specialty carbon steels and stainless. Familiar with cold rolling, annealing, tempering, for processing, planning, control, development and customer contact. Near Newark, N. J. and New York. Box 4-5.

METALLURGICAL ENGINEER: For general work in modern laboratory. Two to five years experience in metallography, heat treating and mechanical testing desirable. METALLURGICAL ENGINEER: For research and development work with regard to tool and die steels and mechanical working operations of ferrous and nonferrous metals. Opportunity to start with a newly organized research laboratory. Will consider recent graduates as well as men with up to five years experience. LABORATORY ASSISTANT: With general metallurgical laboratory experience, required for immediate opening. Need not have college degree but should have at least five years experience. Write: R. Wallace & Sons Manufacturing Co., Wallingford, Conn., attention Employment Manager.

METALLURGICAL ENGINEER: For work with electronic alloys. New expanding electronic division needs a man to work with nonferrous metals such as copper, tungsten, nickel, and electronic alloys. Three years or more experience in trouble shooting, preparation of specifications, metallographic investigation, physical testing, etc. Attractive wage and other benefits. Send resume of experience and salary desired to: Manager Industrial Relations, Westinghouse Electric Corp., Electronic-Tube Division, P. O. Box 284, Elmira, N. Y.

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METALLURGIST: Central Pennsylvania manufacturer has opening for metallurgist experienced in the production heat treating of toolsteel including isothermal heat treating. Send complete resume. Box 4-105.

ENGINEER: Good position and ample opportunities for engineer with some nonferrous metallurgical training for eventual sales work. Need not necessarily be college graduate if background is sufficient. State experience, training, salary expected, and military status in first letter. Box 4-110.

ENGINEER: With nonferrous metallurgical training for laboratory and engineering work in connection with forging copper, copper base alloys and aluminum alloys. Bright future with ample opportunities. State experience, training, salary expected, and military status in first letter. Box 4-115.

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SALES-SERVICE ENGINEER: Metallurgical engineer to sell and service accounts for established commercial heat treating concern with good growth record in a diversified industrial area. Man with tool, die and machine experience who is sales minded can accelerate this growth and benefit from it. Location in St. Louis. Write giving full qualifications. Box 4-15.

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METALLURGICAL ENGINEER: B. S. degree. Ability to analyze problems, write reports. Knowledge of specifications. Nine years of diversified experience in customer contact, plant research, supervision, inspection, and mechanical testing. Desires executive technical position in ferrous metals industry. Will relocate. Box 4-50.

METALLURGICAL ENGINEER: M.S. degree, age 38. Diversified experience in ferrous wire drawing, casting, forging, heat treatment, consulting and university teaching. Solid background in extractive and physical metallurgy. Desires position in production, supervision, with future leading to management. Prefers South, but not an overriding consideration. Minimum $8000. Box 4-55.

METALLURGIST: Expects to receive M.S. in Metallurgy, June. Veteran, age 33, married, two children. Three years experience in research and development for college and industry. Previous experience as metallurgist in plant manufacturing springs and wire forms with additional duty supervising quality control observers. Location not important. Box 4-60.

METALLURGIST: Production, research or sales. B.S. degree, age 42. Twenty years diversified experience in all phases of manufacture, processing, fabrication and sales engineering of alloy and special steels, including 12 years with corrosion and heat resisting grades. Outstanding record of accomplishment. Proven administrative ability, technical writer and consultant. Wide knowledge of quality control methods. Western or Southern location preferred. Box 4-65.

METALLURGICAL ENGINEER: B.A.Sc. degree, age 30, married. Two years experience as metallographer and quality control metallurgist in automotive plant. Five years diversified experience covering the design, manufacture, sales, installation and service of controlled atmosphere furnaces. Box 4-70.

NONFERROUS METALLURGICAL ENGINEER: Age 30, married, B.S. degree. Nine years mill experience in fabrication of aluminum and brass alloys. Thorough knowledge of ingot casting, hot rolling, extrusion, rod drawing, wire drawing. Experienced in setting up fabrication procedures and quality control. Desires position in metallurgical control, research or development. Box 4-75.

METALLURGICAL ENGINEER: Two years experience in market research and product development of light metals. Four years diversified experience in powder metallurgy and chemical laboratory. Age 30, married, family. Desires challenging, responsible market development or technical service position requiring ambition, initiative and judgment. Opportunity is primary requirement. Box 4-80.

METALLURGICAL ENGINEER: Age 30, working toward M.S. (June). Experience includes two years production and supervision plus two years research. Prefers product development but will consider production or research. Must have possibility of advancing to management position. Cleveland area preferred. Box 4-125.

METALLURGIST: Seven years hydrometallurgical research, principally nonferrous; five years plant inspector and metals trouble shooter in high pressure, high temperature hydrogenation plant and corrosion engineer for supporting facilities. Desires similar position in petroleum refinery or research organization in Rocky Mountain area or West Coast. Box 4-130.

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METALLURGIST: Age 36, B.S. degree. Fouteen years experience in development and control. Above average in initiative, ingenuity, and loyalty. Experience and capable of good supervision. Naval officer during war. Desires position in administration, development, sales or trouble shooting. Minimum $10,000 salary required. Prefers Midwest. Box 4-150.

MATERIALS ENGINEER: B.S. degree in metallurgy, age 38, married. Fifteen years diversified experience in research, development, application, testing, and quality control of ferrous and nonferrous metals and their applicable metallurgical and chemical processes. Supervisory experience includes five years aircraft, three years precision instruments. Desires supervisory or staff position of responsibility. Prefers Northeast. Box 4-155.

METALLURGIST: B.S. degree in metallurgical engineering. Has 3½ years laboratory experience, jet aircraft, covering metallograph, ferrous and nonferrous high-temperature alloys, failure analysis, manufacturing problems, heat treating, stress corrosion and report writing. Desires development or production. Married, age 29. Prefers East. Box 4-160.

MANUFACTURERS REPRESENTATIVE located in New York Area, covering Eastern States for leading manufacturer of heavy equipment, wants additional accounts. Prefers machine tools, industrial furnaces or other capital equipment. Box 4-85, Metals Review.

(*Continued from p. 43*)

38-V. New Austenitic Stainless. Good Alternate for 18-8. R. L. Hatschek. *Iron Age,* v. 171, Mar. 12, 1953, p. 135-138.

Alloy using Mn in place of Ni compares with 18-8 in respect to corrosion, fabrication, and fatigue properties. Tables and photographs. (R general, Q7, SS)

39-V. Aluminium and Its Alloys in 1952. E. Elliott. *Metallurgia,* v. 47, Feb. 1953, p. 73-80.

General review of the research and technical progress in various aspects of Al metallurgy. 96 ref. (Al)

40-V. An Appraisal of Silicon and Its Alloys. William R. Johnson and Max Hansen. *Metal Progress,* v. 63, Feb. 1953, p. 105-109.

Describes production, properties, and principal uses. Graphs and micrographs. (Si)

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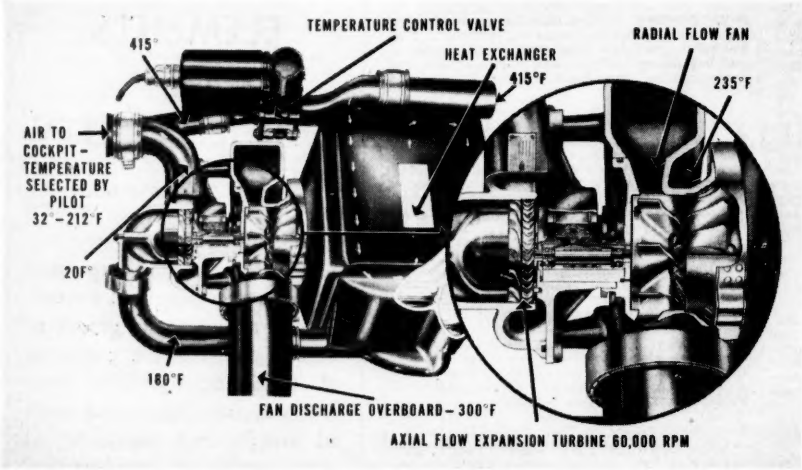

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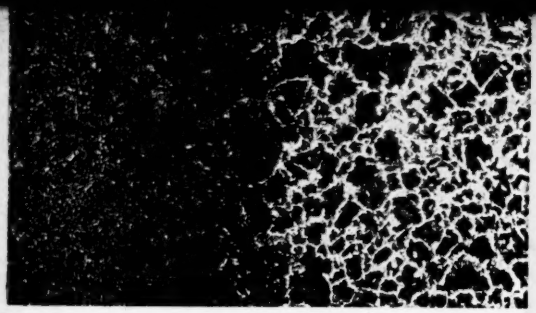

TYPICAL MICROGRAPH
TOTAL DEPTH OF CASE .038"
TOTAL DEPTH OF CASE .35 CARBON .030"
TIME, 4 HRS. TEMPERATURE, 1650° F.
DIMENSIONS OF SPECIMEN, 1" RD. x 4" l.
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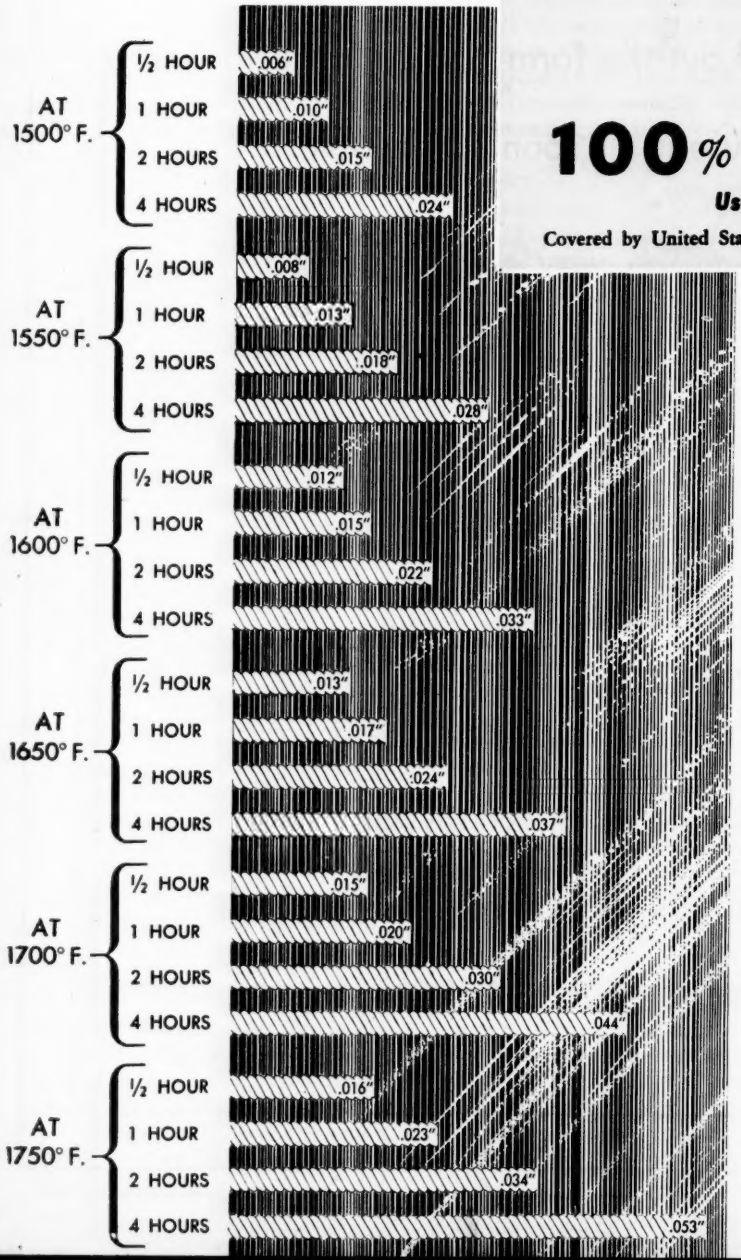
100% WATER SOLUBLE

Used by Industry Since 1933

Covered by United States Patents 2,002,180, 2,046,522, 2,188,068, 2,249,581

CASE DEPTHS VS. TIME



ADAPTABLE
ECONOMICAL
20% LESS WEIGHT

HOLDEN BATHS	CASE DEPTHS
Light Case 50	.001—.005"
Light Case 200	.001—.010"
Hard Case 250	.001—.025"
Hard Case 400	.001—.040"
Hard Case 500	.001—.075"
Hard Case 600	for replenishment only

WHEN PROPERLY OPERATED —
it's never necessary to bail out
and throw away a . . .
HOLDEN CARBURIZING BATH.

HOLDEN
METALLURGICAL PRODUCTS

TRADE MARK REGISTERED

THE A. F. HOLDEN CO.

TWO F.O.B. POINTS:

NEW HAVEN 11
460 Grand Avenue

DETROIT 27
11300 Schaefer Highway

N

d

E

581

HS

05"

10"

25"

40"

75"

only

BATH.

I

CO.

ghway